The University of Adelaide
School of Economics

Research Paper No. 2009-08
March 2009

International Trade Policies Affecting Agricultural Incentives in Developing Countries

Kym Anderson

The University of Adelaide, School of Economics Working Paper Series No: 0067 (2009-08)

International trade policies affecting agricultural incentives in developing countries

Kym Anderson

School of Economics
University of Adelaide
Adelaide, SA 5005, Australia
Phone +61 8 8303 4712
kym.anderson@adelaide.edu.au

October 2008

Revision of a chapter for the *Handbook on Agricultural Economics, Volume IV*, edited by R.E. Evenson, P. Pingali and T. P. Schultz for Elsevier, Amsterdam (forthcoming 2009). This is a product of a World Bank research project on Distortions to Agricultural Incentives (www.worldbank.org/agdistortions). The author is grateful for helpful comments from various workshop participants; for the efforts of nearly 100 authors who provided the country case studies for the Agricultural Distortions project; for computational assistance from a team of assistants led by Ernesto Valenzuela that brought together the global Agricultural Distortions database; and for funding from various World Bank Trust Funds, particularly these provided by the governments of the Netherlands (BNPP) and the United Kingdom (DfID). Views expressed are the authors‟ alone and not necessarily those of the World Bank or its Executive Directors.

Abstract

For decades, earnings from farming in many developing countries have been depressed by a pro-urban bias in own-country policies, as well as by governments of richer countries favoring their farmers with import barriers and subsidies. Both sets of policies reduce national and global economic welfare and inhibit economic growth. In particular, they add to inequality and poverty in developing countries, since three-quarters of the world‟s billion poorest people depend directly or indirectly on farming for their livelihood. During the past two decades, however, numerous developing country governments have reduced their sectoral and trade policy distortions, while some high-income countries also have begun reforming their protectionist farm policies.

This chapter surveys the changing extent of policy distortions to prices faced by developing country farmers. After outlining the basic measurement theory, the chapter provides a brief history of policies of advanced and developing economies and then surveys empirical studies that document the changing extent of price distortions over the past half century. It reviews the economic effects of policy reforms since the early 1980s and of interventions remaining in the early part of the present century, according to global economy wide modeling resuits. The chapter concludes by pointing to the scope and prospects for further pro-poor policy reform at home and abroad.

Keywords: Distorted incentives, agricultural and trade policy reforms

JEL codes: F13, F14, Q17, Q18

Author contact details :

Kym Anderson
School of Economics
University of Adelaide
Adelaide SA 5005
Australia
Phone +61 8 8303 4712
Fax +61 8 8223 1460
kym.anderson@adelaide.edu.au

International trade policies affecting agricultural incentives in developing countries

International trade – which has been going on ever since societies began seeking to improve well-being through specialization in production and exchange – began with agricultural products. Trade between nation states, in both basic and luxury foods, dates back several millennia. The first major inter-continental trade also began with agricultural products, along the Silk Road that linked Europe and Asia. Likewise, agricultural products (spices from South and Southeast Asia) formed the basis of the first truly global trade, which began with the early expeditions of European mariners to the Americas, the Far East and Australasia in the late 1400s. Trade in farm products has since been stimulated by technological changes in transport such as the coming of railways and canals, the replacement of wooden sailing boats with steel-hulled ships propelled by fossil fuels, refrigeration on ships, and the advent of bulk carriers and air freight. And changes in information and communication technologies have added to the scope for farm product trade, beginning with the telegraph in the nineteenth century and boosted hugely in the late twentieth century by the internet, email and mobile telephony.

Even though the benefits from specialization in production and exchange have been recognized for millennia, governments have nonetheless intervened to restrict international trade, including in agricultural goods. Sometimes it would be export taxes, to raise revenue for the government or rulers. An early example was the tax on wine exports: from the Greek island of Thasos in the second century B.C. (Robinson 1994, p. 465), and from France and Germany in the dark ages.[1] At other times it took the form of import duties or bans (often as part of gyrations in international relations). Wine trade between France and Britain again provides a stark example, where import restrictions caused huge fluctuations in bilateral trade

[1] Taxes on Bordeaux exports were so high that when lowered in 1203, tax revenue actually increased (and allowed consumption in Britain to rise to 4.5 litres of claret per capita by 1308 (Johnson 1989, p. 142) -- the same volume as in the early 1970s). Along the Rhine River in the fourteenth century, there were no less than 62 customs points. With such implicit subsidizing of local consumption (and because drinking water was unsafe), the volume of wine consumed per capita by the 15th century in Germany is estimated to have exceeded 120 litres (Johnson 1989, p. 120), or five times today"s per capita consumption.

in the 1700s and 1800s.[2] The practice was so pervasive that wine was used as the example of British imports in the first treatise on the theory of comparative advantage (Ricardo 1817).

For advanced econopmies the most common reason for farm trade restrictions in the past two centuries has been to protect domestic producers from import competition as they come under competitive pressure to shed labour in the course of economic development. But in the process those protective measures hurt not only domestic consumers and exporters but also foreign producers and traders of farm products, and they reduce national and global economic welfare. For many decades agricultural protection and subsidies in high-income (and some middle-income) countries have been depressing international prices of farm products, which lowers the earnings of farmers and associated rural businesses in developing countries. It therefore adds to inequality and poverty, since three-quarters of the world‟s poorest people depend directly or indirectly on agriculture for their main income (World Bank 2007).[3]

But in addition to this external policy influence on rural poverty, the governments of many (especially newly independent) developing countries have directly taxed their farmers over the past half-century. A well-known example is the taxing of exports of plantation crops in post-colonial Africa (Bates 1981). The use of multiple exchange rates also introduced an anti-trade bias. As well, most developing countries chose to also pursue an import-substituting industrialization strategy, predominantly by restricting imports of manufactures. This indirectly taxed other tradable sectors in those developing economies, including agriculture.

This disarray in world agriculture, as D. Gale Johnson (1991) described it in the title of his seminal book, means there has been over-production of farm products in high-income countries and under-production in more-needy developing countries. It also means there has been less international trade in farm products than would be the case under free trade, thereby thinning markets for these weather-dependent products and thus making them more volatile. Using a stochastic model of world food markets, Tyers and Anderson (1992, Table 6.14)

---

[2] French exports to Britain fell from around 10 Ml in the seventeenth century to just 1 Ml from 1690 to 1850, when Portugese exports grew from 0 to 12 Ml and Spain‟s from 4 to 6 Ml per year (Francis 1972, Appendix). See also Nye (2007).

[3] Currently less than 15 million relatively wealthy farmers in developed countries, with an average of almost 80 hectares per worker, are being helped at the expense of not only consumers and taxpayers in those rich countries but also the majority of the 1.3 billion relatively impoverished farmers and their large families in developing countries who, on average, have to earn a living from just 2.5 hectares per worker.

found that instability of international food prices in the early 1980s was three times greater than it would have been under free trade in those products.

Thus the price incentives facing developing country farmers – especially those producing exportables – have been depressed by both own-country and other countries' international trade (including multiple exchange rate) policies, while the insulating aspect of those policies has made international food prices more volatile. During the past quarter century, however, numerous countries have begun to reform their agricultural price and trade policies, which raises the question as to how far the world has come in reducing market distortions relative to how far it still has to go before they are free.

The chapter begins with a brief survey of the methodology required to measure the extent of own-country distortions to farmer incentives. It then surveys analyses of the effects of those trade policies on incentives over time, focusing on the worsening of that situation between the 1950s and mid-1980s and the progress that has been made over the subsequent 25 years. In doing so it provides estimates of the contributions of policies at the national border versus domestic measures to the overall level of farm price distortions in a country.

Notwithstanding recent reforms, many price distortions remain in the agricultural sector of both developing and high-income countries. The second part of the chapter draws on new economy wide computable general equilibrium modeling results as they affect developing countries to examine the market, welfare and net farm income effects of distortions as of 2004 compared with (a) distortions in the early 1980s and (b) a world free of agricultural price and trade policies. The chapter concludes by drawing on what we understand about the political economy of those policies to assess the prospects for reducing remaining distortions. Particular attention is given to the roles international institutions, especially the World Trade Organization (WTO), can play to help phase out remaining welfare-reducing distortions in the wake of ever-evolving suggestions as to why governments should continue to intervene.

National distortions to incentives: basic theory[4]

[4] This section draws heavily on Anderson, Kurzweil, Martin, Sandri and Valemzuela (2008).

Bhagwati (1971) and Corden (1997) define the concept of a market policy distortion as something that governments impose to create a gap between the marginal social return to a seller and the marginal social cost to a buyer in a transaction. Such a distortion creates an economic cost to society which can be estimated using welfare techniques such as those pioneered by Harberger (1971). As Harberger notes, this focus allows a great simplification in evaluating the marginal costs of a set of distortions: changes in economic costs can be evaluated taking into account the changes in volumes directly affected by such distortions, ignoring all other changes in prices. In the absence of divergences such as externalities, the measure of a distortion is the gap between the price paid and the price received, irrespective of whether the level of these prices is affected by the distortion.

Other developments that change incentives facing producers and consumers can include flow-on consequences of the distortion, but these should not be confused with the direct price distortion that needs to be estimated. If, for instance, a country is large in world trade for a given commodity, imposition of an export tax may raise the price in international markets, reducing the adverse impact of the distortion on producers in the taxing country. Another flow-on consequence is the effect of trade distortions on the real exchange rate, which is the price of traded goods relative to non-traded goods. Neither of these flow-on effects are of immediate concern, however, because if the direct distortions are accurately estimated, they can be incorporated as price wedges into an appropriate country or global economy-wide computable general equilibrium (CGE) model which in turn will be able to capture the full general equilibrium impacts (inclusive of terms of trade and real exchange rate effects) of the various direct distortions to producer and consumer prices.

Importantly, the total effect of distortions on the agricultural sector will depend not just on the size of the direct agricultural policy measures, but also on the magnitude of distortions generated by direct policy measures altering incentives in non-agricultural sectors. It is relative prices and hence relative rates of government assistance that affect producers‟ incentives. In a two-sector model an import tax has the same effect on the export sector as an export tax: the Lerner (1936) Symmetry Theorem. This carries over to a model that has many sectors, and is unaffected if there is imperfect competition domestically or internationally or if some of those sectors produce only nontradables (Vousden 1990, pp. 46-47). The symmetry theorem is therefore also relevant for considering distortions *within* the agricultural sector. In particular, if import-competing farm industries are protected, for example via import tariffs, this has similar effects on incentives to produce exportables as does an explicit tax on

agricultural exports; and if both measures are in place, this is a double imposition on farm exporters.

In what follows, we begin by focusing first on direct distortions to agricultural incentives, before turning to those affecting the sector indirectly via non-agricultural policies.

Direct agricultural distortions

Consider a small, open, perfectly competitive national economy with many firms producing a homogeneous farm product with just primary factors. In the absence of externalities, processing, producer-to-consumer wholesale plus retail marketing margins, exchange rate distortions, and domestic and international trading costs, that country would maximize national economic welfare by allowing both the domestic farm product price and the consumer price of that product to equal E times P, where E is the domestic currency price of foreign exchange and P is the foreign currency price of this identical product in the international market. That is, any government-imposed diversion from that equality, in the absence of any market failures or externalities, would be welfare-reducing for that small economy.

Price-distorting trade measures at the national border

The most common distortion is an ad valorem tax on competing imports (usually called a tariff), t_m. Such a tariff on an imported product that is perfect substitute for the domestically produced good is the equivalent of a production subsidy and a consumption tax both at rate t_m. If that tariff on the imported primary agricultural product is the only distortion, its effect on producer incentives can be measured as the nominal rate of assistance to farm output conferred by border price support *(NRA_{BS})*, which is the unit value of production at the distorted price less its value at the undistorted free market price expressed as a fraction of the undistorted price:[5]

$$(1) \qquad NRA_{BS} = \frac{E \times P(1+t_m) - E \times P}{E \times P} = t_m$$

[5] The NRA_{BS} thus differs from the producer support estimate (PSE) as calculated by the OECD, in that the PSE is expressed as a fraction of the distorted value. It is thus $t_m/(1+t_m)$ and so for a positive t_m the PSE is smaller than the NRA_{BS} and is necessarily less than 100 percent.

The effect of that import tariff on consumer incentives in this simple economy is to generate a consumer tax equivalent (CTE) on the agricultural product for final consumers:

(2) $CTE = t_m$

The effects of an import subsidy are identical to those in equations (1) and (2) for an import tax, but t_m in that case would have a negative value.

Governments sometimes also intervene with an export subsidy s_x (or an export tax in which case s_x would be negative). If that were the only intervention:

(3) $NRA_{BS} = CTE = s_x$

If any of these trade taxes or subsidies were specific rather than ad valorem (e.g., \$y/kg rather than z percent), its ad valorem equivalent can be calculated using slight modifications of equations (1), (2) and (3).

Domestic producer and consumer price-distorting measures

Governments sometimes intervene with a direct production subsidy for farmers, s_f (or production tax, in which case s_f is negative, including via informal taxes in kind by local and provincial governments). In that case, if only this distortion is present, the effect on producer incentives can be measured as the nominal rate of assistance to farm output conferred by domestic price support *(NRA_{DS})*, which is as above except s_f replaces t_m or s_x, but the CTE in that case is zero. Similarly, if the government just imposes a consumption tax c_c on this product (or consumption subsidy, in which case c_c is negative), the CTE is as above except c_c replaces t_m or s_x, but the NRA_{DS} in that case is zero.

The combination of domestic and border price support provides the total rate of assistance to output, NRA_o.

(4) $NRA_o = NRA_{BS} + NRA_{DS}$

What if the exchange rate system also is distorting prices?

Should a multi-tier foreign exchange rate regime be in place, then another policy-induced price wedge exists. A simple two-tier exchange rate system creates a gap between the price received by all exporters and the price paid by all importers for foreign currency, changing both the exchange rate received by exporters and that paid by importers from the equilibrium

rate E that would prevail without this distortion in the domestic market for foreign currency (Bhagwati 1978).

Exchange rate overvaluation of the type considered here requires controls by the government on current account transfers. A common requirement is that exporters surrender their foreign currency earnings to the central bank for changing to local currency at a low official rate. This is equivalent to a tax on exports to the extent that official rate is below what the exchange rate would be in a market without government intervention. That implicit tax on exporters reduces their incentive to export and hence the supply of foreign currency flowing into the country. With less foreign currency, demanders are willing to bid up its purchase price. That provides a potential rent for the government, which can be realized by auctioning off the limited supply of foreign currency extracted from exporters or creating a legal secondary market. Either mechanism will create a gap between the official and parallel rates.

Such a dual exchange rate system is depicted in Figure 1, in which is it assumed that the overall domestic price level is fixed, perhaps by holding the money supply constant (Dervis, de Melo and Robinson 1981). The supply of foreign exchange is given by the upward sloping schedule, S_{fx}, and demand by D_{fx}, where the official exchange rate facing exporters is E_0 and the secondary market rate facing importers is E_m. At the low rate E_0, only Q_S units of foreign currency are available domestically, instead of the equilibrium volume Q_E that would result if exporters were able to exchange at the "equilibrium rate" E units of local currency per unit of foreign currency.[6] The gap between the official and the secondary market exchange rates is an indication of the magnitude of the tax imposed on trade by the two-tier exchange rate: relative to the equilibrium rate E, the price of importables is raised by $e_m \times E$, which is equal to $(E_m - E)$, while the price of exportables is reduced by $e_x \times E$, which is equal to $(E - E_0)$, where e_m and e_x are the fractions by which the two-tier exchange rate system raises the domestic price of importables and lowers the domestic price of exportables, respectively. The estimated division of the total foreign exchange distortion

[6] "Equilibrium" in this sense refers to what would prevail without this distortion in the domestic market for foreign currency. In the diagram, and in the discussion that follows, the equilibrium exchange rate E exactly balances the domestic supply and demand for foreign currency. Taken literally, this implies a zero balance on the current account. The approach here can readily be generalized to accommodate exogenous capital flows and transfers, which would shift the location of Q_E. With constant-elasticity supply and demand curves all of the results would carry through, and any exogenous change in those capital flows or transfers would imply a shift in the D_{fx} or S_{fx} curves.

between an implicit export tax, e_x, and an implicit import tax, e_m, will depend on the estimated elasticities of supply of exports and of demand for imports.[7] If the demand and supply curves in Figure 1 had the same slope, then $e_m = e_x$ and $(e_m + e_x)$ is the secondary market premium or proportional rent extracted by the government or its agents.[8]

If the government chooses to allocate the limited foreign currency to different groups of importers at different rates, that is called a multiple exchange rate system. Some lucky importers may even be able to purchase it at the low official rate. The more that is allocated and sold to demanders whose marginal valuation is below E_m, the greater the unsatisfied excess demand at E_m and hence the stronger the incentive for an illegal or „black" market to form, and for less-unscrupulous exporters to lobby the government to legalize the secondary market for foreign exchange and to allow exporters to retain some fraction of their exchange rate earnings for sale in the secondary market. Such a right to exporters to retain and sell a portion of foreign exchange receipts would increase their incentives to export, and thereby reduce the shortage of foreign exchange and hence the secondary market exchange rate (Tarr 1990). In terms of Figure 1, the available supply increases from Q_S to $Q_S^{'}$, bringing down the secondary rate from E_m to $E_m^{'}$ such that the weighted average of the official rate and $E_m^{'}$ received by exporters is $E_x^{'}$ (the weights being the retention rate r and $(1-r)$). Again, if the demand and supply curves in Figure 1 had the same slope, then the implicit export and import taxes resulting from this regime would be each equal to half the secondary market premium.

---

[7] From the viewpoint of wanting to use the NRA_o and CTE estimates later as parameters in a CGE model, it does not matter what assumptions are made here about these elasticities, as the CGE model's results for real variables will not be affected. What matters for real impacts is the magnitude of the total distortion, not its allocation between an export tax and an import tax: the traditional incidence result from tax theory that also applies to trade taxes (Lerner 1936). For an excellent general equilibrium treatment, using an early version of the World Bank's 1-2-3 Model, see de Melo and Robinson (1989). There the distinction is made between traded and non-traded goods (using the Armington (1969) assumption of differentiation between products sold on domestic as distinct from international markets), in contrast to the distinction between tradable and non-tradable products made below.

[8] Note that this same type of adjustment could be made where the government forces exporters to surrender all foreign currency earnings to the domestic commercial banking system and importers to buy all foreign currency needs from that banking system where that system is allowed by regulation to charge excessive fees. This apparently occurs in, for example, Brazil, where the spread early this decade was reputedly 12 percent. If actual costs in a non-distorted competitive system are only 2 percent (as they are in the less-distorted Chilean economy), the difference of 10 points could be treated as the equivalent of a 5 percent export tax and a 5 percent import tax applying to all tradables (but, as with non tariff barriers, there would be no government tariff revenue but rather rent, in this case accruing to commercial banks rather than to the central bank). This is an illustration of the point made by Rajan and Zingales (2004) of the power of financial market reform in expanding opportunities.

In the absence of a secondary market and with multiple rates for importers below E_m and for exporters below E_0, a black market often emerges. Its rate for buyers will be above E by more the more the government sells its foreign currency to demanders whose marginal valuation is below E_m and the more active is the government in catching and punishing exporters selling in that illegal market. If the black market was allowed to operate „frictionlessly" there would be no foreign currency sales to the government at the official rate and the black market rate would fall to the equilibrium rate E. So even though in the latter case the observed premium would be positive (equal to the proportion by which E is above nominal official rate E_0), there would be no distortion. For present purposes, since the black market is not likely to be completely „frictionless", it can be thought of as similar to the system involving a retention scheme. In terms of Figure 1, $E_m^{'}$ would be the black market rate for a proportion of sales and the weighted average of that and E_0 would be the exporters" return. Calculating $E_x^{'}$ in this case (and hence being able to estimate the implicit export and import taxes associated with this regime) by using the same approach as in the case with no illegal market thus requires not only knowing E_0 and the black market premium but also guessing the proportion, r, of sales in that black market.

In short, where a country has distortions in its domestic market for foreign currency, the exchange rate relevant for calculating the NRA_o or the CTE for a particular tradable product depends, in the case of a dual exchange rate system, on whether the product is an importable or an exportable, while in the case of multiple exchange rates it depends on the specific rate applying to that product each year.

What if trade costs are sufficiently high for the product to be not traded internationally?
Suppose the transport costs of trading are sufficient to make it unprofitable for a product to be traded internationally, such that the domestic price fluctuates over time within the band created by the cif import price and the fob export price. Then any trade policy measure (t_m or s_x) or the product-specific exchange rate distortion (e.g., e_m or e_x) is redundant. In that case, in the absence of other distortions, $NRA_o = 0$, and the $CTE = 0$. However, in the presence of any domestic producer or consumer tax or subsidy (s_f or t_c) the domestic prices faced by both producers *and* consumers will be affected. The extent of the impact depends on the price

elasticities of domestic demand and supply for the nontradable (the standard closed-economy tax incidence issue).

To give a specific example, suppose just a production tax is imposed on farmers producing a particular nontradable, so $s_f < 0$ and $t_c = 0$. In that case:

$$(5) \qquad NRA_{DS} = \frac{s_f}{1 + \frac{\varepsilon}{\eta}}$$

and

$$(6) \qquad CTE = \frac{-s_f}{1 + \frac{\eta}{\varepsilon}}$$

where ε is the price elasticity of supply and η is the (negative of the) price elasticity of demand.[9]

What if farm production involves not just primary factors but also intermediate inputs? Where intermediate inputs are used in farm production, any taxes or subsidies on their production, consumption or trade would alter farm value added and thereby also affect farmer incentives. Sometimes a government will have directly offsetting measures in place, such as a domestic subsidy for fertilizer use by farmers but also a tariff on fertilizer imports. In other situations there will be farm input subsidies but an export tax on the final product.[10] In principle all these items could be brought together to calculate an effective rate of direct assistance to farm value added (ERA). The nominal rate of direct assistance to farm output, NRA_o, is a component of that, as is the sum of the nominal rates of direct assistance to all farm inputs, call it NRA_i. In principle, all three rates can be positive or negative. Where there are significant distortions to input costs, their ad valorem equivalent can be accounted for by summing each input"s *NRA* times its input-output coefficient to obtain the combined NRA_i,

[9] As in the two-tier exchange rate case, the elasticities are used merely to identify the incidence of these measures: as long as both the NRAo and the CTE are included in any economic model used to assess the impact of the production tax, the real impacts will depend only on the magnitude of the total distortion, s_f, not on the estimated NRA and CTE.

[10] On this general phenomenon of offsetting distortions for outputs and inputs (and even direct payments or taxes), see Rausser (1982).

and adding that to the farm industry's nominal rate of direct assistance to farm output, NRA_o, to get the total nominal rate of assistance to farm production, call it simply NRA. [11]

$$(7) \qquad NRA = NRA_o + NRA_i .$$

What about post-farmgate costs?

If a state trading corporation is charging excessively for its marketing services and thereby lowering the farm-gate price of a product, for example as a way of raising government revenue in place of an explicit tax, the extent of that excess should be treated as if it is an explicit tax.

Some farm products, including some that are not internationally traded, are inputs into a processing industry that may also be subject to government interventions. In that case the effect of those interventions on the price received by farmers for the primary product also needs to be taken into account.

The mean of agricultural NRAs

When it comes to averaging across countries, each polity is an observation of interest, so a simple average is meaningful for the purpose of political economy analysis. But if one wants a sense of how distorted is agriculture in a whole region, a weighted average is needed. The weighted average NRA for covered primary agriculture can be generated by multiplying each primary industry's value share of production (valued at the farm-gate equivalent undistorted prices) by its corresponding NRA and adding across industries.[12] The overall sectoral rate, $NRAag$, could also include actual or assumed information for the non-covered commodities and, where it exists, the aggregate value of non-product-specific assistance to agriculture.

[11] Bear in mind that a fertilizer plant or livestock feedmix plant might be enjoying import tariff protection that raises the domestic price of fertilizer or feedmix to farmers by more than any consumption subsidy (as had been the case for fertilizer in Korea – Anderson 1983), in which case the net contribution of this set of input distortions to the total NRA for agriculture would be negative.

[12] Corden (1971) proposed that free-trade volume be used as weights, but since they are not observable (and an economy-wide model is needed to estimate them) the common practice is to compromise by using actual distorted volumes but undistorted unit values or, equivalently, distorted values divided by (1+ NRA). If estimates of own-and cross-price elasticities of demand and supply are available, a partial equilibrium estimate of the quantity at undistorted could be generated, but if those estimated elasticities are unreliable this may introduce more error than it seeks to correct.

A weighted average can be similarly generated for the tradables part of agriculture – including those industries producing products such as milk and sugar that require only light processing before they can be traded – by assuming that its share of non-product-specific assistance equals its weight in the total. Call that $NRAag^t$.

The dispersion of agricultural NRAs

In addition to the mean, it is important to provide also a measure of the dispersion or variability of the NRA estimates across the covered products. The cost of government policy distortions to incentives in terms of resource misallocation tend to be greater the greater the degree of substitution in production (Lloyd 1974). In the case of agriculture which involves the use of farm land that is sector-specific but transferable among farm activities, the greater the variation of *NRAs* across industries within the sector, the higher will be the welfare cost of those market interventions. A simple indicator of dispersion is the standard deviation of industry *NRAs* within agriculture.

Anderson and Neary (2005) show that it is possible to develop a single index that captures the extent to which the mean and standard deviation of protection together contribute to the welfare cost of distortionary policies. That index recognizes that the welfare cost of a government-imposed price distortion is related to the square of the price wedge, and so is larger than the mean and is positive regardless of whether the government"s agricultural policy is favoring or hurting farmers. In the case where it is only import restrictions that are distorting agricultural prices, the index provides a percentage tariff equivalent which, if applied uniformly to all imports, would generate the same welfare cost as the actual intra-sectoral structure of protection from import competition. Lloyd, Croser and Anderson (2008) show that, once *NRAs* and *CTEs* have been calculated, they can be used to generate such an index even in the more complex situation where there may be domestic producer or consumer taxes or subsidies in addition to trade taxes or subsidies or quantitative restrictions. They call it a Welfare Reduction Index. They also show that, if one is willing to assume that domestic price elasticities of supply (demand) are equal across farm commodities, then the only information needed to generate the index, in addition to the *NRAs* and *CTEs,* is the share of each commodity in the domestic value of farm production (consumption) at undistorted prices.

Trade bias in agricultural assistance

A trade bias index also is needed, to indicate the changing extent to which a country‟s policy regime has an anti-trade bias within the agricultural sector. This is important because, as mentioned above, the Lerner (1936) Symmetry Theorem demonstrates that a tariff assisting import-competing farm industries has the same effect on farmers‟ incentives as if there was a tax on agricultural exports; and if both measures are in place, this is a double imposition on farm exports. And a dual exchange rate system adds further to the anti-trade bias. The higher is the nominal rate of assistance to import-competing agricultural production ($NRAag_m$) relative to that for exportable farm activities ($NRAag_x$), the more incentive producers in that sub-sector will have bid for mobile resources that would otherwise have been employed in export agriculture, other things equal.

Once each farm industry is classified either as import-competing, or a producer of exportables, or as producing a non-tradable (its status could change over time), it is possible to generate for each year the weighted average $NRAs$ for the two different groups of tradable farm industries. They can then be used to generate an agricultural trade bias index defined as:

$$(8) \qquad TBI = \left[\frac{1 + NRAag_x}{1 + NRAag_m} - 1 \right]$$

where $NRAag_m$ and $NRAag_x$ are the average $NRAs$ for the import-competing and exportable parts of the agricultural sector (their weighted average being $NRAag^t$). This index has a value of zero when the import-competing and export sub-sectors are equally assisted, and its lower bound approaches -1 in the most extreme case of an anti-trade policy bias.

Anderson and Neary (2005) show also that it is possible to develop a single index that captures the extent to which import protection reduces the volume of trade. Once *NRAs* and *CTEs* have been calculated, they can be used to generate a more-general trade reduction index that allows for the trade effects also of domestic price-distorting policies, regardless of whether they (or the trade measures) are positive or negative (Lloyd, Croser and Anderson 2008). Such a measure provides a percentage trade tax equivalent which, if applied uniformly to all agricultural tradables, would generate the same reduction in trade volume as the actual intra-sectoral structure of distortions to domestic prices of farm goods. They also show that, if the domestic price elasticities of supply (demand) are equal across farm commodities, then

again the only information needed in addition to the *NRAs* and *CTEs* is the share of each commodity in the domestic value of farm production (consumption) at undistorted prices.

Indirect agricultural assistance/taxation via non-agricultural distortions

In addition to direct assistance to or taxation of farmers, the Lerner (1936) Symmetry Theorem demonstrates that their incentives are also affected indirectly by government assistance to non-agricultural production in the national economy. The higher is the nominal rate of assistance to non-agricultural tradables production ($NRAnonag^t$), the more incentive producers in other tradable sectors will have bid up the value of mobile resources that would otherwise have been employed in agriculture, other things equal. If $NRAag^t$ is below $NRAnonag^t$, one might expect there to be fewer resources in agriculture than there would be under free market conditions in the country, notwithstanding any positive direct assistance to farmers, and conversely.

One way to capture this is to calculate a Relative Rate of Assistance, *RRA* , defined as:

$$(9) \qquad RRA = \left[\frac{1 + NRAag^t}{1 + NRAnonag^t} - 1 \right]$$

Since an NRA cannot be less than -1 if producers are to earn anything, neither can *RRA* . This measure is a useful indicator for providing international comparisons over time of the extent to which a country"s policy regime has an anti- or pro-agricultural bias.

National distortions to farmer incentives: the evolution of policies

Before turning to the contemporary (post-World War II) situation, it is insightful to examine briefly the long history of government intervention in international markets for farm products by today"s advanced economies, since similar political economy forces may influence policy choices in later-developing countries. Attention then turns to the price-distorting policies of developing countries since the 1950s as they became independent from their colonial masters.

The long history in high-income countries

Long-distance trade between nation states arises whenever the domestic price differs from that of a similar foreign product by more than the costs of making a sale. Price differentials for agricultural products arise from time to time for a range of reasons. The most common is seasonality. Crops ripen at different times in places with different climates, which can give rise to fresh fruit and vegetable imports in the off-season. Also, weather variations cause cereal harvests to vary from year to year so that even countries that are normally food self-sufficient may import following an especially poor season, or export following a bumber harvest.

In addition to seasonality, price differences that affect international trade in farm products can arise through technological changes, particularly in transport and communication services. For example, following the American Civil War the rapid spread of the American rail network in the 1870s and 1880s made it possible to transport wheat to tidewater more cheaply than the canal system. Railroad construction from the Ukranian wheat fields to Crimean ports had a similar effect. Coupled with the shift from wooden to iron ships, these developments lowered very substantially the cost of getting wheat to Western Europe. So in the 1880s when weather patterns generated low yields in Western Europe, wheat farmers there did not enjoy the compensation of an increase in wheat prices. On the contrary, with less natural (transport cost) protection from import competition, and coincidentally high yields in America, they faced real wheat price declines of around 15 per cent between 1873 and 1896 (Kindleberger 1951).

This chapter, however, is concerned with international price differences that result not from natural phenomena but from governmental taxes and subsidies, particularly those at a country‟s border. While much government intervention in agricultural trade over the centuries has been aimed at stabilizing domestic food prices and supplies, there has been a general tendency for poor agrarian economies to tax agriculture relative to other sectors. Then as nations industrialize, their policy regimes have tended to gradually change from negatively to positively assisting farmers relative to other producers (and conversely from subsidizing to taxing food consumers).

Consider Britain, the first country to have an industrial revolution. Prior to that revolution – from the late 1100s to the 1660s – Britain used export taxes and licences to prevent domestic food prices from rising excessively. But during 1660-90 a series of Acts gradually raised food import duties (making imports prohibitive under most circumstances)

and reduced export restrictions on grain (Stuart 1992). These provisions were made even more protective of Brisish farmers by the Corn Laws of 1815. True, the famous repeal of the Corn Laws in the mid-1840s heralded a period of relatively unrestricted food trade for Britain, but then agricultural protection returned in the 1930s and steadily increased over the next five decades.

Similar tendencies have been observed in many other West European countries, although on the Continent the period of free trade in the 19th century was considerably shorter, and agricultural protection levels during the past century were somewhat higher on average than in Britain. Kindleberger (1975) describes how the nineteenth century free trade movements in Europe reflected the national economic, political and sociological conditions of the time. Agricultural trade reform was less difficult for countries such as Britain with overseas territories that could provide the metropole with a ready supply of farm products. The fall in the price of grain imports from America in the 1870s and 1880s provided a challenge for all, however. Denmark coped well by moving more into livestock production to take advantage of cheaper grain. Italians coped by sending many of their relatives to the New World. Farmers in France and Germany successfully sought protection from imports, however, and so began the post-industrial revolution growth of agricultural protectionism in densely populated countries. Meanwhile, tariffs on West European imports of manufactures were progressively reduced after the GATT came into force in the late 1940s, thereby adding to the encouragement of agricultural relative to manufacturing production (Lindert 1991; Anderson 1995).

Japan provides an even more striking example of the tendency to switch from taxing to increasingly assisting agriculture relative to other industries. Its industrialization began later than in Europe, after the opening up of the economy following the Meiji Restoration in 1868. By 1900 Japan had switched from being a small net exporter of food to becoming increasingly dependent on imports of rice (its main staple food and responsible for more than half the value of domestic food production). This was followed by calls from farmers and their supporters for rice import controls. Their calls were matched by equally vigorous calls from manufacturing and commercial groups for unrestricted food trade, since the price of rice at that time was a major determinant of real wages in the nonfarm sector. The heated debates were not unlike those that led to the repeal of the Corn Laws in Britain six decades earlier. In Japan, however, the forces of protection triumphed, and a tariff was imposed on rice imports from 1904. That tariff then gradually rose over time, raising the domestic price of rice to more

than 30 per cent above the import price during World War I. Even when there were food riots because of shortages and high rice prices just after that war, the Japanese government's response was not to reduce protection but instead to extend it to its colonies and to shift from a national to an imperial rice self-sufficiency policy. That involved accelerated investments in agricultural development in the colonies of Korea and Taiwan behind an ever-higher external tariff wall that by the latter 1930s had driven imperial rice prices to more than 60 per cent above those in international markets (Anderson and Tyers 1992). After the Pacific War ended and Japan lost its colonies, its agricultural protection growth resumed and spread from rice to an ever-wider range of farm products.

The other high-income countries were settled by Europeans relatively recently and are far less-densely populated. They therefore have had a strong comparative advantage in farm products for most of their history following Caucasian settlement, and so have felt less need to protect their farmers than Europe or Northeast Asia. Indeed Australia and New Zealand until the present decade have tended – like developing countries – to have adopted policies that discriminated against their farmers (Anderson, Lloyd and MacLaren 2007).[13]

Developing countries since the 1950s

In South Korea and Taiwan in the 1950s, as in many newly independent developing countries, an import-substituting industrialization strategy was initially adopted, which harmed agriculture. But in those two economies – unlike in most other developing countries – that policy was replaced in the early 1960s with a more-neutral trade policy that resulted in their very rapid export-oriented industrialization. That development strategy in those densely populated economies imposed competitive pressure on the farm sector which, just as in Japan in earlier decades, prompted farmers to lobby (successfully, as it happened) for ever-higher levels of protection from import protection (Anderson, Hayami and Others 1986, Ch. 2).

Many less-advanced and less-rapidly growing developing countries not only adopted import-substituting industrialization strategies in the late 1950s/early 1960s (Little Scitovsky

[13] In an early attempt to compile a global set of NRA estimates for agriculture, for use in a 30-region model of world food markets calibrated to 1980-82, Tyers and Anderson (1986, 1992 p. 76) estimated the following OLS regression relationship between those NRAs and data on the log of per capita income relative to the global average (YPC) and an index of agricultural comparative advantage (CA, the food self-sufficiency ratio under free farm trade as generated by their model):

NRA = 0.22 + 0.11YPC – 0.51CA adjusted R^2 = 0.83, n = 30
(8.7) (5.6) (-10.7)

and Scott 1970; Balassa 1971) but also imposed direct taxes on their exports of farm products. It was common in the 1950s and 1960s and in some cases through to the 1980s also to use dual or multiple exchange rates so as to indirectly tax both exporters and importers (Bhagwati 1978, Krueger 1978). This added to the anti-trade bias of developing countries' trade policies. Certainly within the agricultural sector of each country, import-competing industries tended to enjoy more government support than those that were more competitive internationally (Krueger, Schiff and Valdés 1988, 1991; Herrmann et al. 1992; Thiele 2004). The Krueger et al. study also reveals, at least up to the mid-1980s, that direct disincentives for farmers such as agricultural export taxes were less important than indirect disincentives in the form of import protection for the manufacturing sector or overvalued exchange rates, both of which attracted resources away from agricultural industries producing tradable products.

In short, historically countries have tended to gradually change from taxing to subsidizing agriculture increasingly relative to other sectors in the course of their economic development although less so, and at a later stage of development, the stronger a country's comparative advantage in agriculture (Anderson, Hayami and others 1986; Lindert 1991). Hence at any point in time farmers in poor countries tended to face depressed terms of trade relative to product prices in international markets, while the opposite was true for farmers in rich countries (Anderson 1995). Again the exceptions were rich countries with an extreme comparative advantage in agriculture (Australia, New Zealand).

While that policy history of developing countries is now well known, and has been documented extensively in previous surveys (e.g., Krueger 1984), less well-known is the extent to which many emerging economies have belatedly followed the example of South Korea and Taiwan in abandoning import-substitution and opening their economies. Some (e.g., Chile) started in the 1970s while others (e.g., India) did not do so in a sustained way until the 1990s. Some have adopted a very gradual pace of reform, with occasional reversals, while others have moved rapidly to open markets. And some have adopted the rhetoric of reform but in practice have done little to free up their economies. To get a clear sense of the overall impact of these reform attempts, there is no substitute for empirical analysis that quantifies over time the types of indicators raised in the theory section above, to which we now turn. Again it is helpful to begin with analyses of the more advanced economies, not least because they were completed before systematic time series studies covering developing countries.

National distortions to farmer incentives: empirical estimates since the 1950s

After post-war reconstruction, Japan continued to raise its agricultural protection, just as had been happening in Western Europe, but to even higher levels. Domestic prices exceeded international market prices for grains and livestock products by less than 40 per cent in both Japan and the European Community in the 1950s.[14] By the early 1980s the difference was more than 80 per cent for Japan but was still around 40 percent for the EC – and was still close to zero for the agricultural-exporting rich countries of Australasia and North America (Anderson Hayami and others 1986, Table 2.5). Virtually all of that assistance to Japanese and European farmers in that period was due to restrictions on imports of farm products, rather than domestic producer subsidies.

Since, 1986 the OECD Secretariat has been computing annual producer and consumer support estimates (PSEs and CSEs) by member countries. For the OECD as a whole, the PSE rose between 1986-88 and 2005-07 in US dollar terms (from $239 to $263 billion) but has come down when expressed as a share of support-inclusive returns to farmers (from 37 to 26 percent). Because of some switching of support instruments, including to measures that are based on non-current production or on long-term resource retirement, the share of that assistance provided via market price support measures has fallen from three-quarters to one-half. When the PSE payment is expressed as a percentage of undistorted prices to make it an NRA, so as to be comparable with the definition in equation (7) above, the NRA fall is from 59 to 35 percent between 1986-88 and 2005-07 (OECD 2008a). This indicator suggests OECD policies have become considerably less trade distorting at least in proportional terms, even though farmer support in high-income countries has continued to grow in dollar terms because of growth in the value of their farm output.

As for developing countries outside Northeast Asia, the main comprehensive set of pertinent estimates over time is for the period just prior to when reforms became widespread. They were generated as part of a major study of 18 developing countries for the 1960s to the mid-1980s by Krueger, Schiff and Valdés (1988, 1991). That study by the World Bank,

[14] Gulbrandsen and Lindbeck (1973, p. 38) estimate that the average nominal rate of agricultural protection in Western Europe increased from less than 30 per cent in the 1930s and early 1950s to around 40 per cent in the latter 1950s and 60 per cent by the latter 1960s.

whose estimates are summarized in Schiff and Valdés (1992), shows that the depression of incentives facing farmers has been due only partly to various forms of agricultural price and trade policies, including subsidies to food imports. Much more important in many cases have been those developing countries" non-agricultural policies that hurt their farmers indirectly. The two key ones have been manufacturing protectionism (which attract resources from agriculture to the industrial sector) and overvalued exchange rates (which attract resources to sectors producing nontradables, such as services). That indirect impact was negative for all four groups of countries shown in Table 1, whereas the impact of direct agricultural policies was negative only for the two lowest-income country groups. In addition to the total assistance being more negative the poorer the country group, Table 1 also reveals that it is lower for producers of exportables than for the sub-sector focused on import-competing farm products, suggesting a strong anti-trade bias for the sector as a whole.

Since there were no comprehensive multi-country, multi-region studies of the Krueger/Schiff/ Valdés type for developing countries that monitored progress over the reform period,[15] a new study was launched by the World Bank in 2006 aimed at filling this lacuna. The new study covers not only 41 developing countries but also 14 European transition economies as well as 20 high-income countries. The results from that study[16] do indeed reveal that there has been a substantial reduction in distortions to agricultural incentives in developing countries over the past two to three decades. They also reveal that progress has not been uniform across countries and regions, and that – contrary to some earlier claims (e.g., from Jensen, Robinson and Tarp 2002) – the reform process is far from complete. In particular, many countries still have a strong anti-trade bias in the structure of assistance within their agricultural sector; and some countries have „overshot" in the sense that they have moved from having an average rate of assistance to farmers that was negative to one that is positive, rather than stopping at the welfare-maximizing rate of zero. Moreover, the variance in rates of assistance across commodities within each country, and in aggregate rates across countries, remains substantial; and the begger-thy-neighbor practice of insulating domestic

[15] Exception include a pair of follow-on studies by Valdés (1996, 2000) for a sample of Latin American and European transition economies, and a recent study of four Asian countries by Orden et al. (2007).
[16] A global overview of the results is provided in Anderson (2009), and the detailed country case studies are reported in four regional volumes covering Africa (Anderson and Masters 2009), Asia (Anderson and Martin 2009), Latin American (Anderson and Valdés 2008) and Europe's transition economies (Anderson and Swinnen 2008).

markets from international food price fluctuations continues, thereby exacerbating that volatility.

The global summary of those new results is provided in Figure 2. It reveals that the nominal rate of assistance (NRA) to farmers in high-income countries rose steadily over the pos-World War II period through to the end of the 1980s, apart from a small dip when international food prices spiked around 1973-74. After peaking at more than 50 percent in the mid-1980s, that average NRA for high-income countries has fallen a little, depending on the extent to which one believes some new farm programs are „decoupled" in the sense of no longer influencing production decisions. For developing countries, too, the average NRA for agriculture has been rising, but from a level of around -25 percent during the period from the mid-1950s to the early 1980s to a level of nearly 10 percent in the first half of the present decade. Thus the global gross subsidy equivalent of those rates of assistance have risen very substantially in constant (2000) US dollar terms, from close to zero up to the mid-1970s to more than $200 billion per year at the farm-gate since the mid-1990s (Figure 3).

When expressed on a per farmer basis, the gross subsidy equivalent (GSE) varies enormously as between high-income and developing countries. In 1980-84 the GSE in high-income countries was already around $8,000 and by 2000-04 it had risen to $10,000 on average (and $25,000 in Norway, Switzerland and Japan), or $13,500 when „decoupled" payments are included. By contrast, the GSE in developing economies was -$140 per farmer in the first half of the 1980s, which is a non-trivial tax when one recalls that at that time the majority of these people"s households were surviving on less than $1 a day per capita. By 2000-04 they received on average around $50 per farmer (Anderson 2009, Ch. 1). While this represents a major improvement, it is less than one percent of the support received by the average farmer in high-income countries.

The developing economies of Asia – including Korea and Taiwan, which were both very poor at the start of the period – have experienced the fastest transition from negative to positive agricultural NRAs. Latin American economies first increased their taxation of farmers but gradually moved during the mid-1970s to the mid-2000s from around -20 percent to 5 percent. Africa"s NRAs were similar though slightly less negative than those of Latin America until the latter 1980s, before they fell back to -7 percent (implying a gross tax equivalent per farmer of $6). In Europe"s transition economies farmer assistance fell to almost zero at the start of their transition from socialism in the early 1990s; but since then, in

preparation for EU accession or because of booms in exports of energy raw materials, assistance has gradually increased to nearly 20 percent, or $550 per farmer (Anderson 2009, Ch. 1).

The developing country average NRA also conceals the fact that the exporting and import-competing sub-sectors of agriculture have very different NRAs. Figure 4 reveals that while the average NRA for exporters has been negative throughout (going from -20 percent to -30 percent before coming back up to almost zero in 2000-04), the NRA for import-competing farmers in developing countries has fluctuated between 20 and 30 percent (and even reached 40 percent in the low-priced years in the mid-1980s). Having increased in the 1960s and 1970s, the anti-trade bias within agriculture for developing countries has diminished considerably since the mid-1980s,[17] but the NRA gap between the two sub-sectors still averages around 20 percentage points.

A further decomposition of the developing countries‟ NRAs worth commenting on is the contribution to them from trade policy measures at each country‟s border as distinct from domestic output or input subsidies or taxes. Often political attention is focused much more on direct domestic subsidies or taxes than on trade measures, because those fiscal measures are made so transparent though the annual budgetary scrutiny process whereas trade measures are reviewed only infrequently and are far less transparent, especially if they are not in the simple form of ad valorem tariffs. That attention would appear to be misplaced, however, because between 80 and 90 percent of the NRA for developing country agriculture (not including non-product-specific support, which is very minor) comes from border measures such as import tariffs or export taxes (Anderson 2009, Ch. 1).

Finally, the improvement in farmers‟ incentives in developing countries is understated by the above NRAag estimates, because those countries have also reduced their assistance to producers of non-agricultural tradable goods, most notably manufactures. The decline in the weighted average NRA for the latter, depicted in Figure 5, was clearly much greater than the increase in the average NRA for tradable agricultural sectors for the period to the mid-1980s, consistent with the finding of Krueger, Schiff and Valdés (1988, 1991). For the period since the mid-1980s, changes in both sector‟s NRAs have contributed almost equally to the improvement in farmer incentives. The Relative Rate of Assistance, captured in equation (5)

above, provides a useful indicator of relative price change: the RRA for developing countries as a group went from -46 percent in the second half of the 1970s to 1 percent in the first half of the present decade. This increase (from a coefficient of 0.54 to 1.01) is equivalent to an almost doubling in the relative price of farm products, which is a huge change in the fortunes of developing country farmers in just a generation. This is mostly because of the changes in Asia, but even for Latin America that relative price hike is one-half, while for Africa that indicator improves by only one-eighth (Figure 6).

With this as background, attention now turns to the market and welfare effects of the distortions to agricultural incentives in both high-income and poorer countries. This is done using first the simple partial equilibrium index approach outlined in the methodology, and then using a global economy wide modelling approach with the model calibrated to 2004. That provides a helpful benchmark against which to compare reforms since the 1980s as well as prospects for liberalizing global markets for agricultural and other products.

New Indexes of Agricultural Price Distortions

To capture distortions imposed by each country's border and domestic policies on its economic welfare and its trade volume, Lloyd, Croser and Anderson (2008) define a Welfare Reduction Index (WRI) and a Trade Reduction Index (TRI) and estimate them for 75 countries since 1960, taking into account that the NRA differs from the CTE for some products. As their names suggest, these two indexes respectively capture in a single indicator the direct welfare- or trade-reducing effects of distortions to consumer and producer prices of covered farm products from all agricultural and food policy measures in place (while ignoring non-covered farm products and indirect effects of sectoral and trade policy measures directed at non-agricultural sectors). The WRI measure reflects the true welfare cost of agricultural price-distorting policies better than the NRA because it captures the disproportionately higher welfare costs of peak levels of assistance or taxation. Also, the WRI and TRI measures are comparable across time and place. They thus go somewhat closer to what a computable

[17] The weighted average anti-trade bias index, defined above in equation (8), has fallen between 1980-84 and 2000-04 from -0.38 to -0.15 for Africa, from -0.49 to -0.15 for Asia, and from -0.32 to -0.19 for Latin America

general equilibrium (CGE) can provide in the way of estimates of the trade and welfare (and other) effects of the price distortions captured by the product NRA and CTE estimates; and they have the advantage over CGE models of being able to provide an annual time series.

The WRI five-year results in Figure 7 indicate a fairly constant tendency for covered products' policies to reduce welfare from the 1960s to the mid-1980s, but some decline in the 1990s. This pattern is generated by different policy regimes in the different country groups though: in high-income countries, covered products were assisted throughout the period, although less so after the 1980s, whereas covered products in developing countries were disprotected until the most recent years. That is, the WRI has the desirable property of correctly identifying the welfare consequences that result from both positive and negative assistance regimes, because it captures the dispersion of NRAs among covered products: the larger the variance in assistance levels, the greater the potential for resources to be used in activities which do not maximize economic welfare. One consequence is that the WRI values are much higher than the NRAs for high-income countries. Another consequence is that the WRI for Africa spikes in the mid-1980s in contrast to the NRA which moves close to zero. The reason is that while Africa was still taxing exportables it had moved (temporarily) from low to very high positive levels of protection for import-competing farm products. At the aggregate level African farmers received almost no government assistance then (NRA close to zero), but the welfare cost of its mixture of agricultural policies as a whole was at its highest then, according to the WRI. A third consequence is that for developing countries its average WRI in the years 1995 to 2004 is around 20 percent even though its average NRA for covered products in those years is close to zero, again reflecting the high dispersion across product NRAs – particularly between exportables and import-competing goods – in each country.

For developing countries as a group, the trade restrictiveness of agricultural policy was roughly constant until the early 1990s and thereafter it declined, especially for Asia and Latin America, according to the 5-year average TRI estimates (Figure 8). For high-income countries the TRI time path was similar but the decline began a few years later. The aggregate results for developing countries are being driven by the exportables sub-sector which is being taxed and the import-competing sub-sector which is being protected (albeit by less than in high-income countries). For high-income countries, policies have supported

---

(Anderson 2009, Ch. 1).

both exporting and import-competing agricultural products and, even though they favor the latter much more heavily, the assistance to exporters has offset somewhat the anti-trade bias from the protection of import-competing producers in terms of their impacts on those countries' aggregate volume of trade in farm products. Thus up to the early 1990s the TRI for high-income countries was below that for developing countries; and, to use again the example of Africa, in 1985-89 when the NRA was closest to zero the TRI peaked, correctly identifying the trade-reducing effect of positive protection to the import-competing farmers and disprotection to producers of exportables.

Economy-Wide Effects of Past Reforms and Remaining Policies

It is clear from the above that there has been a great deal of change over the past quarter of a century in policy distortions to agricultural incentives throughout the world: the anti-agricultural and anti-trade biases of policies of many developing countries have been reduced, export subsidies of high-income countries have been cut, and some re-instrumentation toward less inefficient and less trade-distorting forms of support, particularly in Western Europe, has begun. However, protection from agricultural import competition has continued to be on an upward trend in both rich and poor countries, notwithstanding the Uruguay Round Agreement on Agriculture that aimed to bind and reduce farm tariffs. What, then, have been the net economic effects of agricultural price and trade policy changes around the world since the early 1980s? And how do those effects on global markets, farm incomes and economic welfare compare with the effects of policy distortions still in place as of 2004? Valenzuela, van der Mensbrugghe and Anderson (2009) use a global economy-wide model known as Linkage (van der Mensbrugghe 2005) to provide a combined retrospective and prospective analysis that seeks to assess how far the world has come, and how far it still has to go, in removing the disarray in world agriculture. It quantifies the impacts both of past reforms and current policies by comparing the effects of the project"s distortion estimates for the period 1980-84 with those of 2004.

Several key findings from that economy-wide modeling study are worth emphasizing. First, the policy reforms from the early 1980s to the mid-2000s improved global economic welfare by $233 billion per year, and removing the distortions remaining as of 2004 would

add another $168 billion per year (in 2004 US dollars). This suggests that in a global welfare sense the world had moved three-fifths of the way towards global free trade in goods over that quarter century.

Second, developing economies benefited proportionately more than high-income economies (1.0 percent compared with 0.7 percent of national income) from those past policy reforms, and would gain nearly twice as much as high-income countries if all countries were to complete that reform process (an average increase of 0.9 percent compared with 0.5 percent for high-income countries). Of those prospective welfare gains from global liberalization, 60 percent would come from agriculture and food policy reform. This is a striking result given that the shares of agriculture and food in global GDP and global merchandise trade are less than 9 percent. The contribution of farm and food policy reform to the prospective welfare gain for just developing countries is even greater, at 83 percent.

Third, the share of global farm production exported (excluding intra-EU trade) in 2004 was slightly smaller as a result of those reforms since 1980-84, because of less farm export subsidies. Agriculture"s 8 percent share in 2004 contrasts with the 31 percent share for other primary products and the 25 percent for all other goods – a „thinness" that is an important contributor to the volatility of international prices for weather-dependent farm products. If the policies distorting goods trade in 2004 were removed, the share of global production of farm products that is exported would rise from 8 to 13 percent, thereby reducing instability of prices and quantities of those products traded.

Fourth, the developing countries" share of the world"s primary agricultural exports rose from 43 to 55 percent, and its farm output share from 58 to 62 percent, because of the reforms since the early 1980s, with rises in nearly all agricultural industries except rice and sugar. Removing remaining goods market distortions would boost their export and output shares even further, to 64 and 65 percent, respectively.

Fifth, the average real price in international markets for agricultural and food products would have been 13 percent lower had policies not changed over the past quarter century. Evidently the impact of the RRA fall in high-income countries (including the cuts in farm export subsidies) in raising international food prices more than offset the opposite impact of the RRA rise (including the cuts in agricultural export taxes) in developing countries over that period. By contrast, removing remaining distortions as of 2004 is projected to raise the international price of agricultural and food products by less than 1 percent on average. This is contrary to earlier modeling results based on the GTAP protection database. (For example,

Anderson, Martin and van der Mensbrugghe (2006) estimated they would rise by 3.1 percent or, for just primary agriculture, by 5.5 percent). The lesser impact in these new results is because export taxes in developing countries based on the above NRA estimates for 2004 are included in the new database (most notably for Argentina) and their removal would offset the international price-raising effect of eliminating import protection and farm subsidies elsewhere.

Sixth, for developing countries as a group, net farm income (value added in agriculture) is estimated to be 4.9 percent higher than it would have been without the reforms of the past quarter century, which is more than ten times the proportional gain for non-agriculture. If policies remaining in 2004 were removed, net farm incomes in developing countries would rise a further 5.6 percent, compared with just 1.9 percent for non-agricultural value added. As well, returns to unskilled workers in developing countries – the majority of whom work on farms – would rise more than returns to other productive factors from that liberalization. Together, these findings suggest both inequality and poverty could be alleviated by such reform, given that three-quarters of the world"s poor are farmers in developing countries (Chen and Ravallion 2008).

Finally, removal of agricultural price-supporting policies in high-income countries would undoubtedly lead to painful reductions in income and wealth for farmers there if they were not compensated – although it should be kept in mind that the majority of farm household income in high-income countries comes from off-farm sources (OECD 2008b). But the gainers in the rest of their societies could readily afford to compensate them fiscally from the benefits of freeing trade.

Prospects for Further Reductions in Distortions

It is not obvious how future policies might develop. A quick glance at the above policy indicators could lead one to view developments from the early 1960s to the mid-1980s as an aberrant period of welfare-reducing policy divergence (negative and declining RRAs in low-income countries, positive and rising RRAs in most high-income countries) that has given way to welfare-improving and poverty-reducing reforms during which the two country groups" RRAs are converging. But on inspection of the NRAs for exporting and import-

competing sub-sectors of agriculture (Figure 4), it is clear that the convergence of NRAs to near zero is mainly with respect to the exporting sub-sector, while NRAs for import-competing farmers are positive and trending upwards over time at the same rate in both developing and high-income countries – notwithstanding the Uruguay Round Agreement on Agriculture which was aimed at tariffying and reducing import protection. True, applied tariffs have been lowered or suspended as a way of dealing with the international food price spike in 2008, but this, and the food export taxes or quantitative restrictions imposed that year by numerous food-exporting developing countries, may be only until international prices return to trend (as happened after the price hike of 1973-74 and the price dip of 1986-87).

The indications are very mixed as to why some countries appear to have reformed their price-distorting agricultural and trade policies more than others in recent decades, and why some have stubbornly resisted reform. Some reforming countries have acted unilaterally, apparently having become convinced that it is in their own national interest to do so. China is but the most dramatic and significant example of the past three decades among developing countries, while among the high-income countries only Australia and New Zealand are in that category. Others may have done so partly to secure bigger and better loans from international financial institutions and then, having taken that first step, they have continued the process, even if somewhat intermittently. India is one example, but there are numerous examples also in Africa and Latin America. Few have gone backwards in terms of increasing their anti-agricultural bias, but Zimbabwe and perhaps Argentina qualify during the present decade – and numerous others have joined them in 2008, at least temporarily, in response to the sudden upward spike in international food prices. And some have reduced their agricultural subsidies and import barriers at least partly in response to the GATT"s multilateral Uruguay Round Agreement on Agriculture, the European Union being the most important example (helped by its desire also for otherwise-costly preferential trade agreements, including its recent expansion eastwards).

The EU reforms suggest agricultural protection growth can be slowed and even reversed if accompanied by re-instrumentation away from price supports to decoupled measures or more direct forms of farm income support. The starker examples of Australia and New Zealand show that one-off buyouts can bring faster and even complete reform.[18] But in

[18] For a detailed analysis of the buyout option versus the slower and less complete cashout option (moving to direct payments), as well as the uncompensated gradual squeeze-out or sudden cutout options, see Orden and Diaz-Bonilla (2006).

the developing countries where levels of agricultural protection are generally below high-income levels, there are fewer signs of a slowdown of the upward trend in agricultural protection from import competition over the past helf-century.

Indeed, there are numerous signs that developing country governments want to keep open their options to raise agricultural NRAs in the future, particularly via import restrictions. One indicator is the high tariff bindings developing countries committed themselves to following the Uruguay Round: as of 2001, actual applied tariffs on agricultural products averaged less than half the corresponding bound tariffs for developing countries of 48 percent, and less than one-sixth in the case of least-developed countries (Anderson and Martin 2006, Table 1.2).

Another indicator of agricultural trade reform reluctance is the unwillingness of many developing countries to agree to major cuts in bound agricultural tariffs in the WTO‟s on-going Doha round of multilateral trade negotiations. Indeed, many of them believe high-income countries should commit to reducing their remaining farm tariffs and subsidies before developing countries should offer further reform commitments of their own. Yet modeling results reported in Valenzuela, van der Mensbrugghe and Anderson (2009) suggest that if high-income countries alone were to liberalize their agricultural markets, such a sub-global reform would provide less than two-thirds of the potential gains to developing countries that could come from global agricultural policy reform.

More than that, the current negotiations have brought to prominence a new proposal for agricultural protectionism in developing countries. This is based on the notion that agricultural protection is helpful and needed for food security, livelihood security and rural development. This view has succeeded in bringing “Special Products” and a “Special Safeguard Mechanism” into the multilateral trading system‟s agricultural negotiations, despite the fact that such policies, which would raise domestic food prices in developing countries, may worsen poverty and the food security of the poor (Ivanic and Martin 2008).

To wait for high-income country reform before liberalizing the farm trade of developing countries is unwise as a poverty alleviating strategy, not least because the past history revealed in the NRAs summarized above suggests such reform will be at best slow in coming. In the US, for example, the most recent two five-year farm bills were steps backwards from the previous regime which at least sought to re-instrument protection towards less trade-distorting measures (Gardner 2009). Nor have the world‟s large number of

new regional integration agreements of recent years been very successful in reducing farm protection. Furthermore, for developing countries to postpone their own reform would be to forego a major opportunity to boost theirs and (given the size and growth in South-South trade of late) their neighbors‟ economies. It would be doubly wasteful if, by being willing to commit to reform in that way, they would be able to convince high-income countries to reciprocate by signing on to a more-ambitious Doha agreement, the potential global benefits from which are very considerable.[19]

Developing countries that continue to free up domestic markets and practice good macroeconomic governance will keep growing, and typically the growth will be more rapid in manufacturing and service activities than in agriculture, especially in the more densely populated countries where agricultural comparative advantage is likely to decline. Whether such economies become more dependent on imports of farm products depends, however, on what happens to their relative Rates of Assistance (RRA). The first wave of Asian industrializers (Japan, and then Korea and Taiwan) chose to slow the growth of food import dependence by raising their NRA for agriculture even as they were bringing down their NRA for non-farm tradables, such that their RRA became increasingly above the neutral zero level. A key question is: will later industrializers follow suit, given the past close association of RRAs with rising per capita income and falling agricultural comparative advantage? Figure 9 suggests developing countries‟ RRA trends of the past three decades have been on the same upward trajectory as the high-income countries prior to the 1990s. So unless new forces affect their polities, the governments of later industrializing economies may well follow suit.

One new force is disciplines on farm subsidies and protection policies of WTO member countries following the Uruguay Round. Earlier industrializers were not bound under GATT to keep down their agricultural protection. Had there been strict disciplines on farm trade measures at the time Japan and Korea joined GATT in 1955 and 1967, respectively, their NRAs may have been halted at less than 20 percent (Anderson 2009, figure 1.12). At the time of China‟s accession to WTO in December 2001, its NRA was less than 5 percent according to Huang et al. (2009), or 7.3 percent for just import-competing agriculture. Its average bound import tariff commitment was about twice that (16 percent in 2005), but what matters most is China‟s out-of-quota bindings on the items whose imports are restricted by

[19] On the size of those potential net benefits compared with those from other opportunities that could address the world's most important challenges as conceived by the Copenhagen Consensus project (whose expert panel

tariff rate quotas. The latter tariff bindings as of 2005 were 65 percent for grains, 50 percent for sugar and 40 percent for cotton (Anderson, Martin and Valenzuela 2008). Clearly the legal commitments even China made on acceding to WTO are a long way from current levels of support for its farmers, and so are unlikely to constrain the government very much in the next decade or so. And the legal constraints on developing countries that joined the WTO earlier are even less constraining. For India, Pakistan and Bangladesh, for example, their estimated NRAs for agricultural importables in 2000-04 are 34, 4 and 6 percent, respectively, whereas the average bound tariffs on their agricultural imports are 114, 96 and 189 percent, respectively (WTO, ITC and UNCTAD 2007). Also, like other developing countries, they have high bindings on product-specific domestic supports of 10 percent and another 10 percent for non-product specific assistance, a total of 20 more percentage points of NRA (17 percent in China"s case) that legally could come from domestic support measures – compared with currently 10 percent in India and less than 3 percent in the rest of South Asia.

Hopefully developing countries will choose not to make use of the legal wiggle room they have allowed themselves in their WTO bindings to follow Japan, Korea and Taiwan into high agricultural protection. A much more efficient and equitable strategy would be to instead treat agriculture in the same way they have been treating non-farm tradable sectors. That would involve opening the sector to international competition, and relying on more-efficient domestic policy measures for raising government revenue (e.g., income and consumption or value-added taxes) and to assist farm families (e.g., public investment in rural education and health, rural infrastructure, and agricultural research and development). According to Table 2, investments in public agricultural R&D in developing countries as a group is currently equivalent to less than 1 percent of the gross value of farm production (about half the intensity of high-income countries). Given the extremely high rates of return at the margin to such investments (see, e.g., Fan 2008), expenditure on that would be far wiser than providing price supports to appease demands from agribusiness vested interests as middle-income economies develop.

As for high-income countries, the above distortion estimates show that they have all lowered the price supports for their farmers since the 1980s. In some countries that has been partly replaced by assistance that is at least somewhat decoupled from production. If that

---

ranked trade reform as having the second highest payoff among those dozens of opportunities), see www.copenhagenconsensus.org including the trade paper by Anderson and Winters (2008).

trend continues at the pace of the past quarter century, and if there is no growth of agricultural protection in developing countries, then before the middle of this century most of the disarray in world food markets will have been removed. However, if the WTO"s Doha Development Agenda collapses, and governments thereby find it more difficult to ward off agricultural protection lobbies, it is all the more likely that developing countries will follow the same agricultural protection path this century as that which was taken by high-income countries last century. One way to encourage developing countries to follow a more liberal policy path could be to extend the Integrated Framework"s Diagnostic Trade Integration Study (DTIS) process to a broader range of low-income countries. That process, which provides action plans for policy and institutional reform and lists investment and technical assistance needs, could be expanded to include the „aid for trade reform" proposal that has been discussed in the context of the Doha round (Hoekman 2005) – regardless of the fate of the that round.

References

Anderson, J. and P. Neary (2005), *Measuring the Restrictiveness of International Trade Policy,* Cambridge MA: MIT Press.

Anderson, K. (1983), „Fertilizer Policy in Korea", *Journal of Rural Development* 6(1): 43-57, June.

Anderson, K. (1995), "Lobbying Incentives and the Pattern of Protection in Rich and Poor Countries", *Economic Development and Cultural Change* 43(2): 401-23, January.

Anderson, K. (ed.) (2009), *Distortions to Agricultural Incentives: A Global Perspective, 1955 to 2007,* London: Palgrave Macmillan and Washington DC: World Bank (forthcoming).

Anderson, K., Y. Hayami and Others (1986), *The Political Economy of Agricultural Protection*, Boston, London and Sydney: Allen and Unwin.

Anderson, K., M. Kurzweil, W, Martin, D. Sandri and E. Valenzuela (2008), „Measuring Distortions to Agricultural Incentives, Revisited", *World Trade Review* 7(4): 675–704, October.

Anderson, K., P.J. Lloyd and D. MacLaren (2007), „Distortions to Agricultural Incentives in Australia Since World War II", *The Economic Record* 83(263): 461-82, December.

Anderson, K. and W. Martin (eds.) (2006), *Agricultural Trade Reform and the Doha Development Agenda*, London: Palgrave Macmillan and Washington DC: World Bank.

Anderson, K. and W. Martin (eds.) (2009), *Distortions to Agricultural Incentives in Asia*, Washington DC: World Bank.

Anderson, K., W. Martin and E. Valenzuela (2008), „Long Run Implications of WTO Accession for Agriculture in China", in *China's Agricultural Trade: Issues and Prospects*, edited by C. Carter and I. Sheldon, London: CABI (forthcoming).

Anderson, K., W. Martin and D. van der Mensbrugghe (2006), „Distortions to World Trade: Impacts on Agricultural Markets and Farm Incomes", *Review of Agricultural Economics* 28(2): 168-94, Summer.

Anderson, K. and W. Masters (eds.) (2009), *Distortions to Agricultural Incentives in Africa*, Washington DC: World Bank.

Anderson, K. and J. Swinnen (eds.) (2008), *Distortions to Agricultural Incentives in Europe's Transition Economies*, Washington DC: World Bank.

Anderson, K. and R. Tyers (1992), „Japanese Rice Policy in the Interwar Period: Some Consequences of Imperial Self Sufficiency", *Japan and the World Economy* 4(2): 103-27, September.

Anderson, K. and A. Valdés (eds.) (2008), *Distortions to Agricultural Incentives in Latin America*, Washington DC: World Bank.

Anderson, K. and E. Valenzuela (2008), „Estimates of Distortions to Agricultural Incentives, 1955 to 2007", World Bank, Washington DC, downloadable at www.worldbank.org/agdistortions.

Anderson, K. and L.A. Winters (2009), „The Challenge of Reducing International Trade and Migration Barriers", Ch. in *Global Crises, Global Solutions* (2nd edition), edited by B. Lomborg, Cambridge and New York: Cambridge University Press (forthcoming).

Balassa, B. and Associates (1971), *The Structure of Protection in Developing Countries*, Baltimore: Johns Hopkins University Press.

Bates, R.H. (1981), *Market and States in Tropical Africa: The Political Basis of Agricultural Policies*, Berkeley: University of California Press.

Bhagwati, J.N. (1971), „The Generalized Theory of Distortions and Welfare", in *Trade, Balance of Payments and Growth,* edited by J.N. Bhagwati et al., Amsterdam: North-Holland.

Bhagwati, J.N. (1978), *Foreign Trade Regimes and Economic Development: Anatomy and Consequences of Exchange Control Regimes*, Cambridge, MA: Ballinger.

Chen, S, and M. Ravallion (2008), „The Developing World is Poorer Than We Thought, But No Less Successful in the Fight Against Poverty", Policy Research Working Paper 4703, World Bank, Washington DC, August.

Corden, W.M. (1971), *The Theory of Protection*, Oxford: Clarendon Press.

Corden, W.M. (1997), *Trade Policy and Economic Welfare* (second edition), Oxford: Clarendon Press.

de Melo, J. and S. Robinson (1989), „Product Differentiation and the Treatment of Foreign Trade in Computable General Equilibrium Models of Small Economies", *Journal of International Economics* 27: 47-67.

Dervis, K., J. de Melo and S. Robinson (1981), "A General Equilibrium Analysis of Foreign Exchange Shortages in a Developing Country", *Economic Journal* 91: 891-906.

Fan, S. (2008), *Public Expenditures, Growth and Poverty in Developing Countries: Issues, Methods and Findings,* Baltimore: Johns Hopkins University Press.

Francis, A.D. (1972), *The Wine Trade*, London: Adams and Charles Black.

Gardner, B. (2009), „United States and Canada", Ch. 4 in K. Anderson (2009), *Distortions to Agricultural Incentives: A Global Perspective, 1955 to 2007,* London: Palgrave Macmillan and Washington DC: World Bank (forthcoming).

Gulbrandsen, O. and A. Lindbeck (1973), *The Economics of the Agricultural Sector*, Uppsala: Almquist and Wicksell.

Harberger, A. (1971), „Three Basic Postulates for Applied Welfare Economics: An Interpretative Essay", *Journal of Economic Literature* 9(3): 785-97, September.

Herrmann, R., P. Schenck, R. Thiele and M. Wiebelt (1992), *Discrimination Against Agriculture in Developing Countries?* Tubingen: J.C.B. Mohr.

Hoekman, B. (2005), „Making the WTO More Supportive of Development", *Finance and Development* pp. 14-18, March.

Huang, J., S. Rozelle, W. Martin and Y. Liu (2009), „China", Ch. 3 in *Distortions to Agricultural Incentives in Asia*, edited by K. Anderson and W. Martin , Washington DC: World Bank.

Ivanic, M. and W. Martin (2008), „Implications of Higher Global Food Prices for Poverty in Low-Income Countries", Policy Research Working Paper 4594, World Bank, Washington DC, April.

Jensen, H.T., S. Robinson and F. Tarp (2002), „General Equilibrium Measures of Agricultural Policy Bias in Fifteen Developing Countries", TMD Discussion Paper No. 105, IFPRI, Washington DC, October.

Johnson, D.G. (1991), *World Agriculture in Disarray* (revised edition), London: St Martin's Press.

Johnson, H. (1989), *The Story of Wine*, London: Mitchell Beasley.

Kindleberger, C.P. (1951), „Group Behaviour and International Trade", *Journal of Political Economy* 59(1): 30-47, February.

Kindleberger, C.P. (1975), „The Rise of Free Trade in Western Europe, 1820-1875", *Journal of Economic History*, **35** (1): 20-55, March.

Krueger, A.O. (1978), *Foreign Trade Regimes and Economic Development: Liberalization Attempts and Consequences*, Cambridge, MA: Ballinger.

Krueger, A.O. (1984), „Trade Policies in Developing Countries", Ch. 11 in *Handbook of International Economics, Vol. 1: International Trade,* edited by R.W. Jones and P.B. Kenen, Amsterdam: North-Holland.

Krueger, A.O., M. Schiff and A. Valdés (1988), „Agricultural Incentives in Developing Countries: Measuring the Effect of Sectoral and Economy-wide Policies", *World Bank Economic Review* 2(3)): 255-72, September.

Krueger, A.O., M. Schiff and A. Valdés (1991), *The Political Economy of Agricultural Pricing Policy, Volume 1: Latin America, Volume 2: Asia, and Volume 3: Africa and the Mediterranean,* Baltimore: Johns Hopkins University Press for the World Bank.

Lerner, A. (1936), „The Symmetry Between Import and Export Taxes", *Economica* 3(11): 306-13, August.

Lindert, P. (1991), „Historical Patterns of Agricultural Protection", in *Agriculture and the State*, edited by P. Timmer, Ithaca: Cornell University Press.

Little, I.M.D., T. Scitovsky and M. Scott (1970), *Industry and Trade in Some Developing Countries: A Comparative Study*, London: Oxford University Press.

Lloyd, P.J. (1974), „A More General Theory of Price Distortions in an Open Economy", *Journal of International Economics* 4(4): 365-86, November.

Lloyd, P.J., J. Croser and K. Anderson (2008), „Welfare- and Trade-reducing Indexes of Distortions to Agricultural Incentives", Ch. 11 in *Distortions to Agricultural Incentives: Global Perspective,* edited by K. Anderson, London: Palgrave Macmillan and Washington DC: World Bank (forthcoming).

Martin, W. (1993), „Modeling the Post-Reform Chinese Economy", *Journal of Policy Modeling* 15(5&6): 545-79.

Nye, J.V.C. (2007), *War, Wine, and Taxes: The Political Economy of Anglo-French Trade 1689-1900*, Princeton NJ: Princeton University Press.

OECD (2008a), *Producer and Consumer Support Estimates* (online database accessed at www.oecd.org).

OECD (2008b), *The Role of Farm Households and the Agro-Food Sector in the Economy of Rural Areas: Evidence and Policy Implications*, TAD/CA/APM/WP(2008)25, Organization for Economic Co-operation and Development, Paris, 18 September.

Orden, D., F. Cheng, H. Nguyen, U. Grote, M. Thomas, K. Mullen and D. Sun (2007), *Agricultural Producer Support Estimates for Developing Countries: Measurement Issues and Evidence from India, Indonesia, China and Vietnam*, IFPRI Research Report 152, Washington DC: International Food Policy Research Institute.

Orden, D. and E. Diaz-Bonilla (2006), „Holograms and Ghosts: New and Old Ideas for Reforming Agricultural Policies", Ch. 11 in *Agricultural Trade Reform and the Doha Development Agenda*, edited by K. Anderson and W. Martin, London: Palgrave Macmillan and Washington DC: World Bank.

Pardey, P., N.M. Beintima, S. Dehmer and S. Wood (2006), *Agricultural Research: A Growing Global Divide?* Food Policy Report 17, Washington DC: International Food Policy Research Institute.

Rajan, R. and Zingales (2004), *Saving Capitalism from the Capitalists: Unleashing the Power of Financial Markets to Create Wealth and Spread Opportunity*, Princeton: Princeton University Press.

Rausser, G.C. (1982), „Political Economic Markets: PERTs and PESTs in Food and Agriculture", *American Journal of Agricultural Economics* 64(5): 821-33, December.

Ricardo, D. (1817), *On the Principles of Political Economy and Taxation*, London: John Murray.

Robinson, J. (1994), *The Oxford Companion to Wine*, London: Oxford University Press.

Schiff, M. and A. Valdés (1992), *The Political Economy of Agricultural Pricing Policy, Volume 4: A Synthesis of the Economics in Developing Countries,* Baltimore: Johns Hopkins University Press for the World Bank.

Stuart, C. (1992), "Corn Laws and Modern Agricultural Trade Policy", Seminar Paper 524, Institute for International Economic Studies, University of Stockholm.

Tarr, D. (1990), „Second-Best Foreign Exchange Policy in the Presence of Domestic Price Controls and Export Subsidies", *World Bank Economic Review* 4(2): 175-93, May.

Thiele, R. (2004), „The Bias Against Agriculture in Sub-Saharan Africa: Has it Survived 20 Years of Structural Adjustment Programs?" *Quarterly Journal of International Agriculture* 42(1): 5-20.

Tyers, R. and K. Anderson (1992), *Disarray in World Food Markets: A Quantitative Assessment*, Cambridge and New York: Cambridge University Press.

Valdés, A. (1996), „Surveillance of Agricultural Price and Trade Policy in Latin America During Major Policy Reforms", World Bank Discussion Paper No. 349, Washington DC, November.

Valdés, A. (ed.) (2000), „Agricultural Support Policies in Transition Economies", World Bank Technical Paper No. 470, Washington DC, May.

Valenzuela, E., D. van der Mensbrugghe and K. Anderson (2009), „General Equilibrium Effects of Price Distortions on Global Markets, Farm Incomes and Welfare", Ch. 13 in K. Anderson (ed.), *Distortions to Agricultural Incentives: A Global Perspective, 1955 to 2007,* London: Palgrave Macmillan and Washington DC: World Bank (forthcoming).

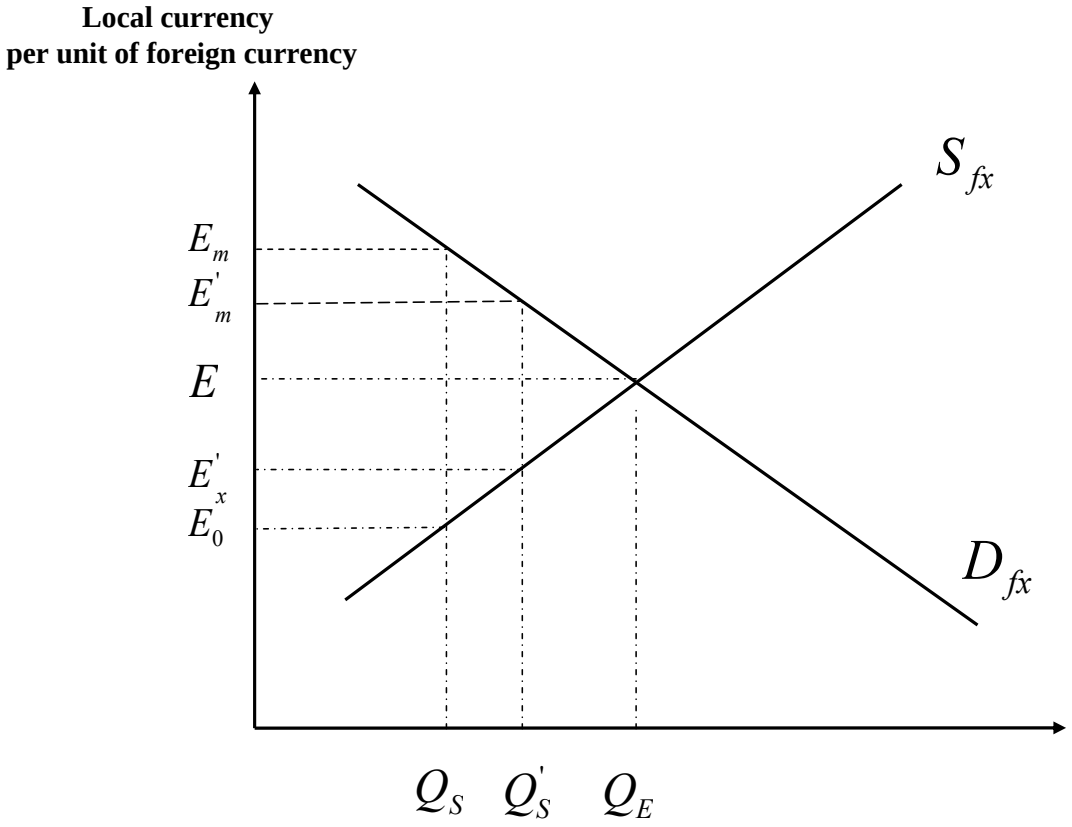
van der Mensbrugghe, D. (2005), „LINKAGE Technical Reference Document: Version 6.0," Unpublished, World Bank, Washington DC, January 2005. Accessable at www.worldbank.org/prospects/linkagemodel

Vousden, N. (1990), *The Economics of Trade Protection,* Cambridge: Cambridge University Press.

World Bank (2007), *World Development Report 2008: Agriculture for Development*. World Bank: Washington DC.

WTO, ITC and UNCTAD (2007), *Tariff Profiles 2006*, Geneva: World Trade Organization.

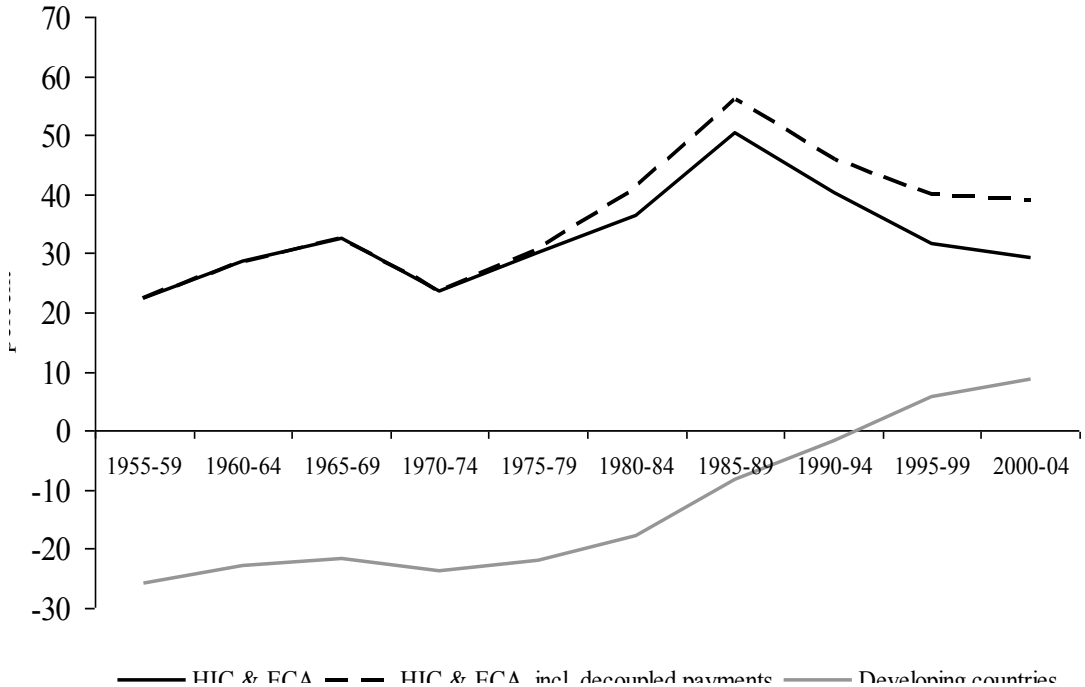
Figure 1: A distorted domestic market for foreign currency



Source: Martin (1993). See also Dervis, de Melo and Robinson (1981).

Figure 2: Nominal rates of assistance to agriculture in high-income and European transition economies and in developing countries, 1955 to 2004

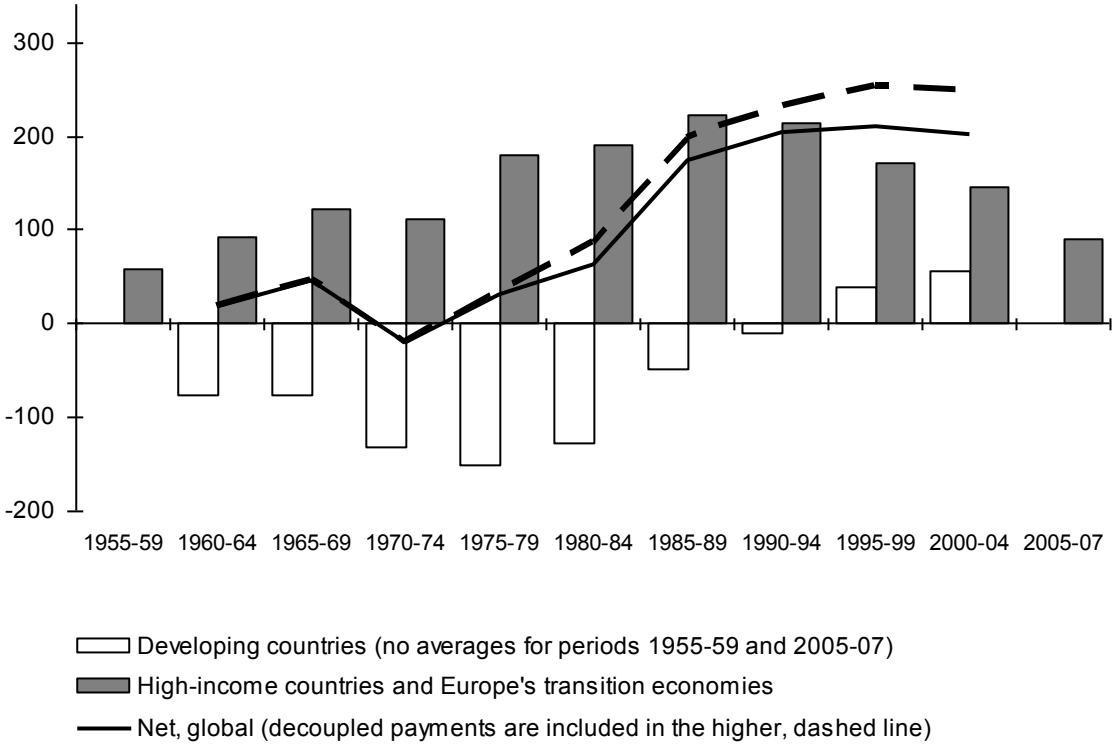
(percent, weighted averages, with „decoupled" payments included in the dashed HIC line)



Source: Anderson (2009).

Figure 3: Gross subsidy equivalent of NRAs in high-income and European transition economies and in developing countries, 1960 to 2007

(constant 2000 US$ billion)

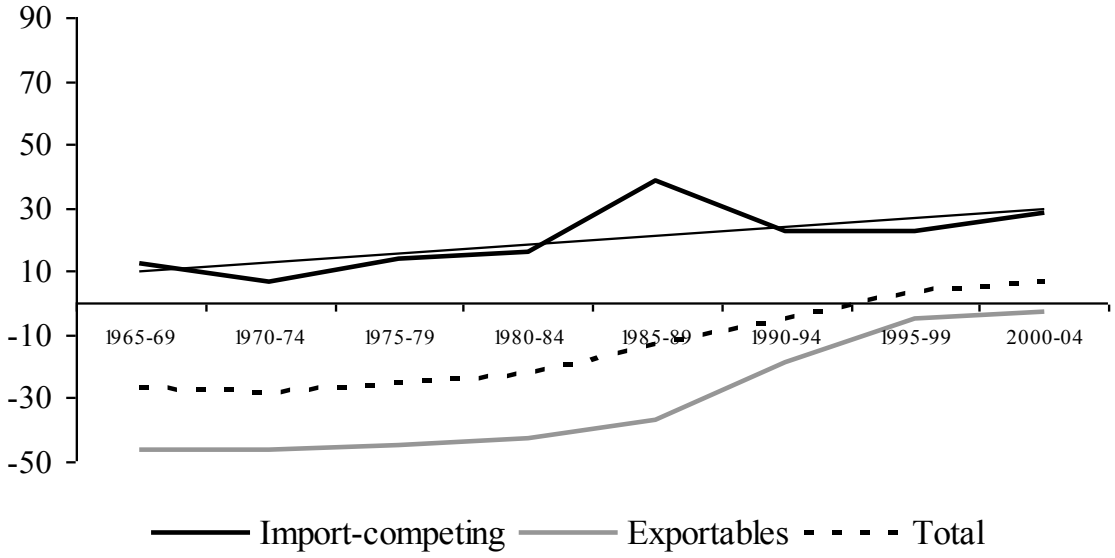


Source: Anderson (2009).

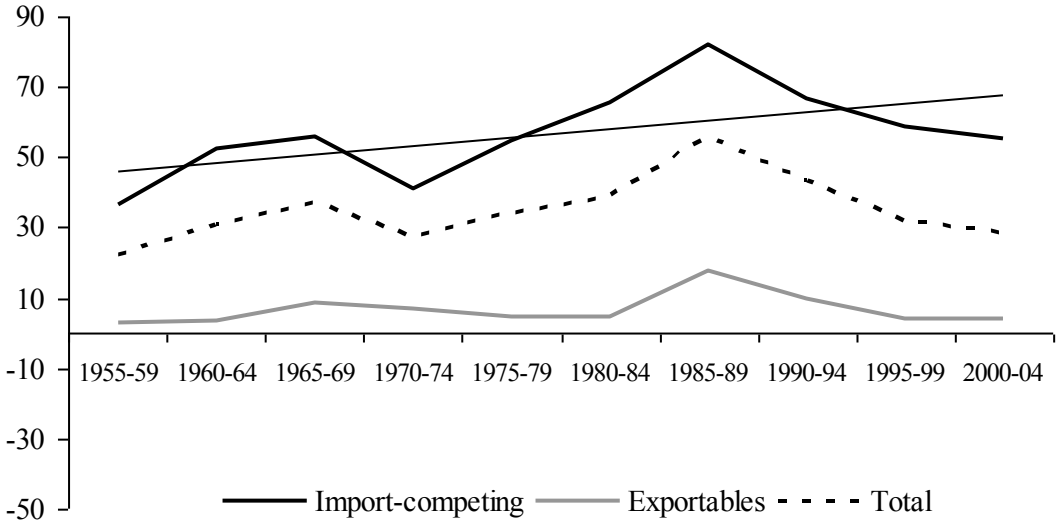
Figure 4: Nominal rates of assistance to exportable, import-competing and all covered agricultural products,[a] high-income and developing countries, 1955 to 2007

(percent)

(a) Developing countries



(b) High-income countries plus Europe"s transition economies

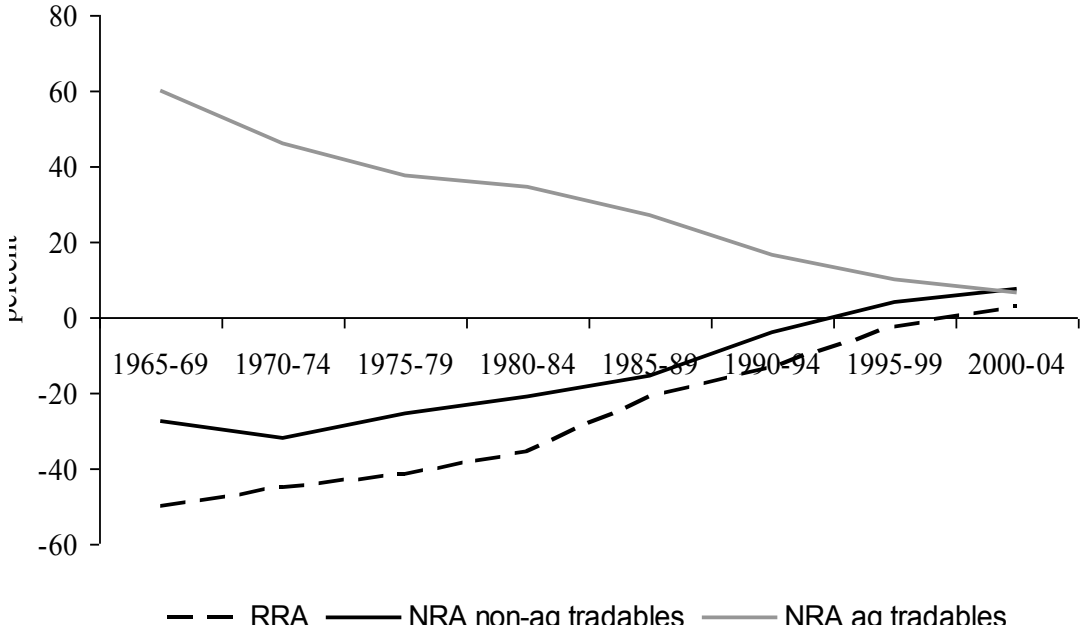


a. Covered products only. The total also includes nontradable.

Source: Anderson (2009).

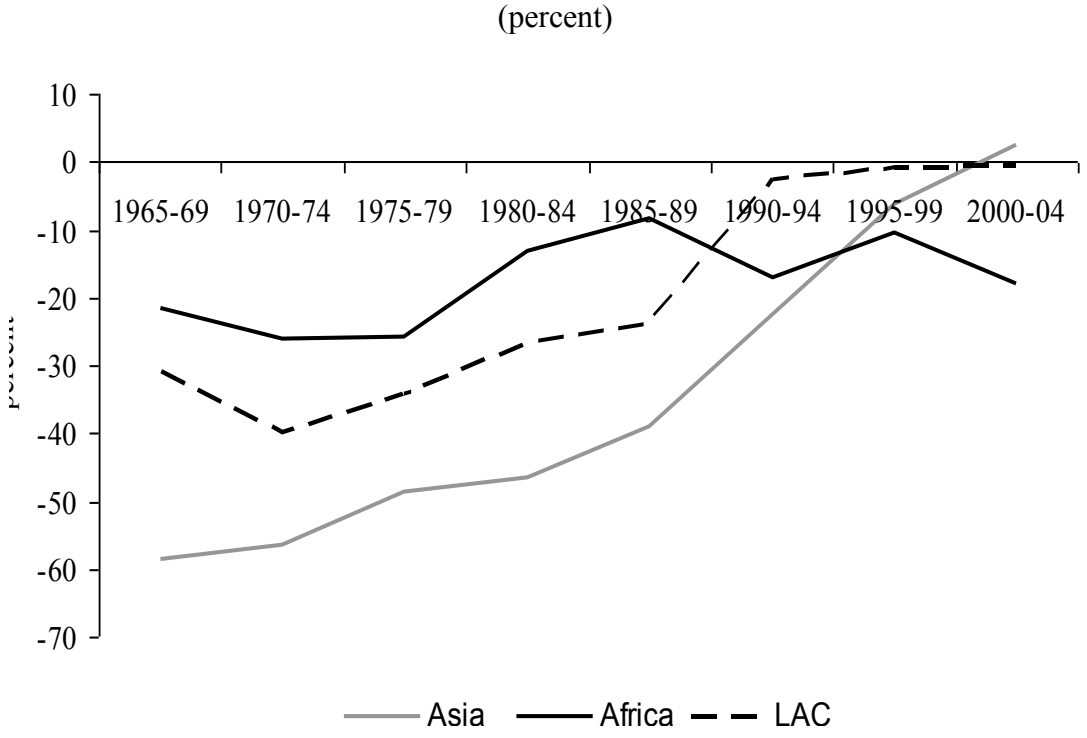
Figure 5: Nominal rates of assistance to agricultural and non-agricultural sectors and relative rate of assistance,[a] developing countries, 1965[b] to 2004

(percent, weighted averages)



a. The RRA is defined as 100*[(100+NRAag^t)/(100+NRAnonag^t)-1], where NRAag^t and NRAnonag^t are the percentage NRAs for the tradables parts of the agricultural and non-agricultural sectors, respectively.
b. Assumes China"s NRA values pre-1981 were the same as in 1981-84.
Source: Anderson (2009).

Figure 6: Relative rates of assistance to tradables,[a] Asia, Africa and Latin America, 1965 to 2004

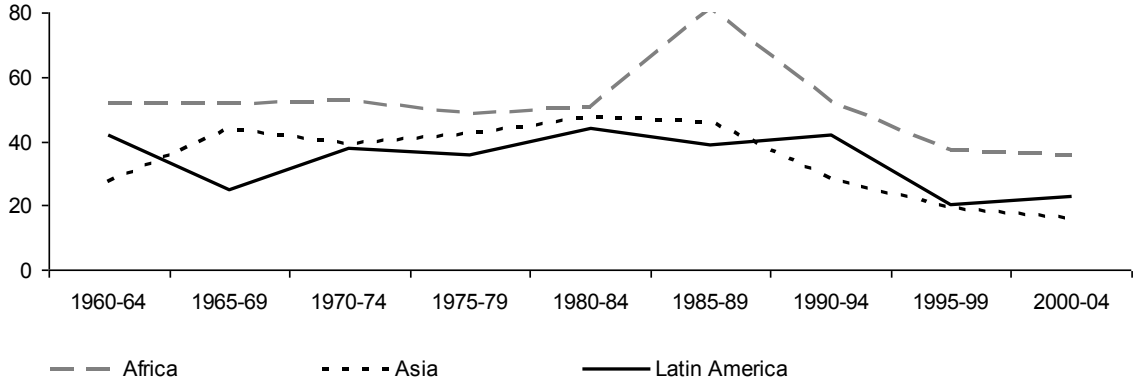


a. 5-year weighted averages with value of production at undistorted prices as weights. In Asia, estimates for China pre-1981 are based on the assumption that the nominal rate of assistance to agriculture and non-agricultural tadables and hence the RRA in those earlier years were the same as the average NRA estimates for China in 1981-89.
Source: Anderson (2009)

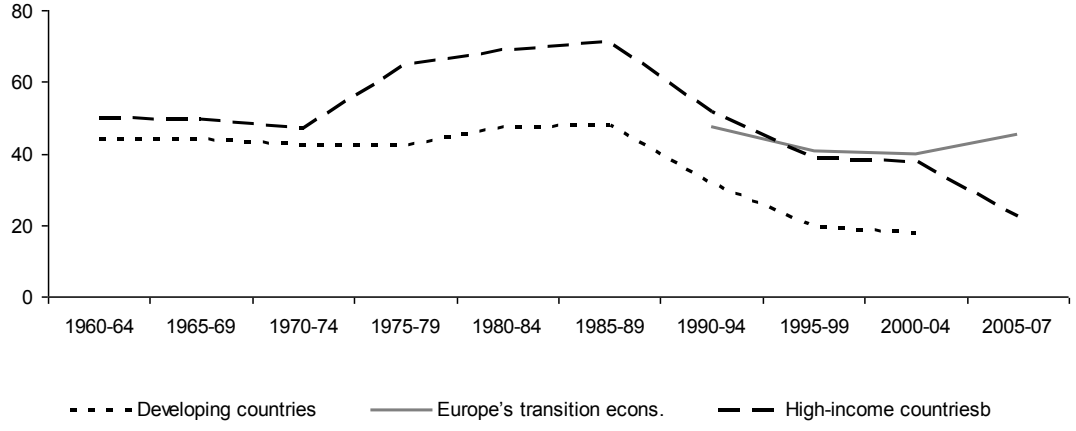
Figure 7: Welfare Reduction Indexes for covered tradable farm products, by region, 1960 to 2007

(percent)

(a) Africa, Asia and Latin America



(b) Developing countries, high-income countries and Europe"s transition economies

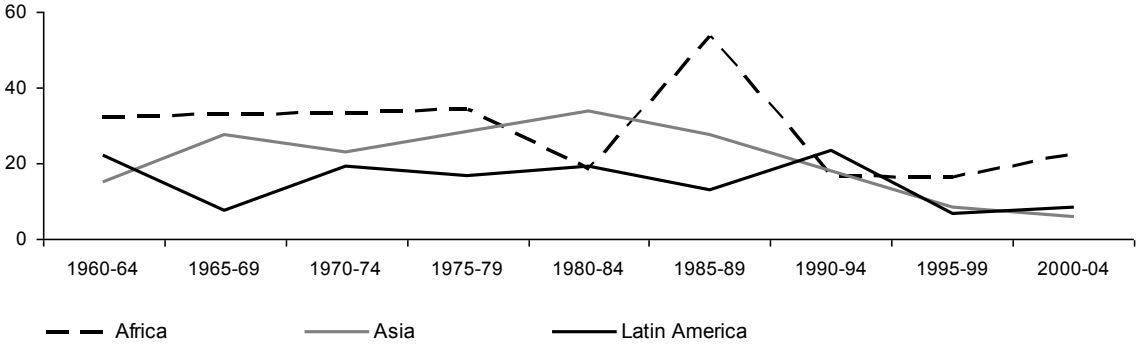


Source: Lloyd, Croser and Anderson (2008), based on NRAs and CTEs in Anderson and Valenzuela (2008).

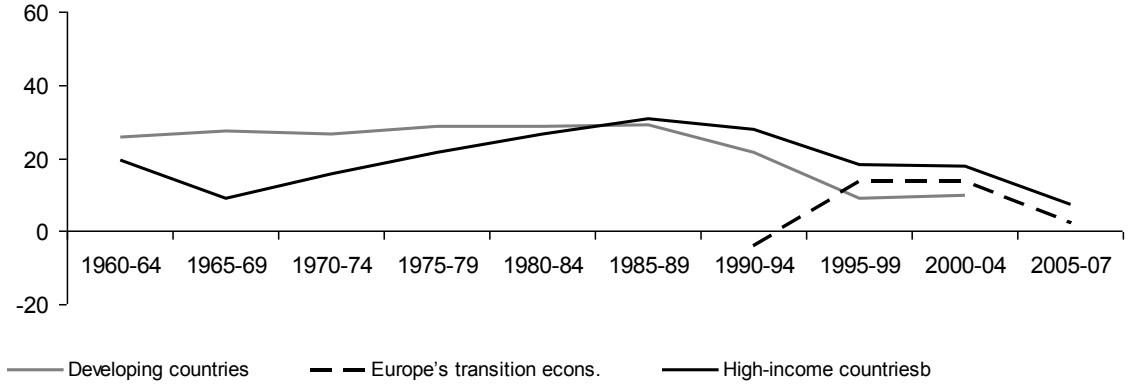
Figure 8: Trade Reduction Indexes for covered tradable farm products, by region, 1960 to 2007

(percent)

(a) Africa, Asia and Latin America

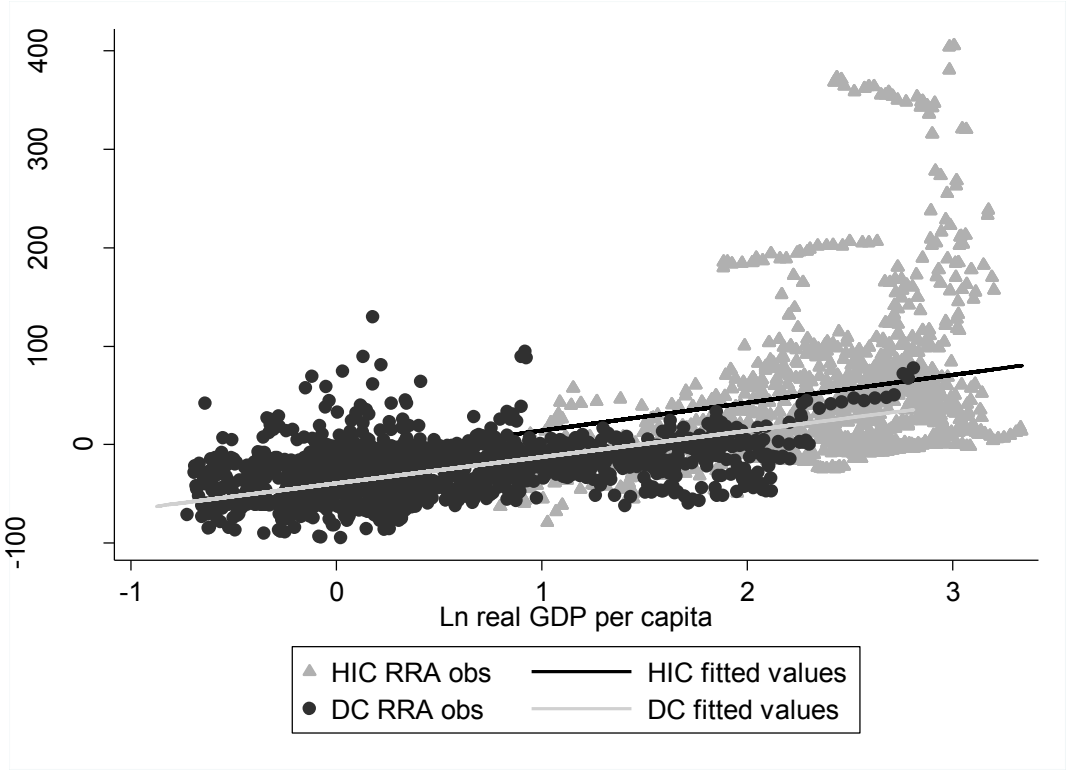


(b) Developing countries, high-income countries and Europe"s transition economies



Source: Lloyd, Croser and Anderson (2008), based on NRAs and CTEs in Anderson and Valenzuela (2008).

Figure 9: Relationships between real GDP per capita and RRA,[a] all focus countries, 1955 to 2007



	Coefficient	Standard error	R^2
DCs	0.26	0.02	0.17
HICs	0.28	0.03	0.14

Source: Anderson (2009) using country fixed effects and the RRA estimates in Anderson and Valenzuela (2008).

Table 1: Direct and indirect nominal rates of assistance to farmers in 18 developing countries, 1960 to mid-1980s

(percent)

Country group:	Direct assistance	Indirect assistance	**Total assistance**[a]	Assistance to agric. export sub-sector[a]	Assistance to agric. import-competing sub-sector[a]
Very low income	-23	-29	**-52**	-49	-11
Low income	-12	-24	**-36**	-40	-13
Lower middle income	0	-16	**-16**	-14	-2
Upper middle income	24	-14	**10**	-1	15
Unweighted sample average	**-8**	**-22**	**-30**	**-35**	**-9**

[a] Total assistance is the weighted average of assistance to the agricultural sub-sectors producing exportables, importables and nontradables (the latter not shown above).

Source: Schiff and Valdés (1992, Tables 2-1 and 2-2).

Table 2: Intensity of public agricultural R&D expenditure, high-income and developing country regions, 1971 to 2004
(as percent of gross value of agric production at undistorted prices)

	1970s	**1980s**	**1990s**	**2000-04**
All High-Income Countries	2.2	2.2	1.9	1.6
All Developing Countries	0.4	0.6	0.75	0.9
Asia	0.3	0.6	0.7	0.9
Latin America	0.2	0.4	0.45	0.6
Sub-Saharan Africa	1.2	1.1	1.2	1.1

Source: Anderson and Valenzuela (2008), based on R&D data from the CGIAR‟s Agricultural Science and Technology Indicator s website at www.asti.cgiar.org (see Pardey et al. 2006).